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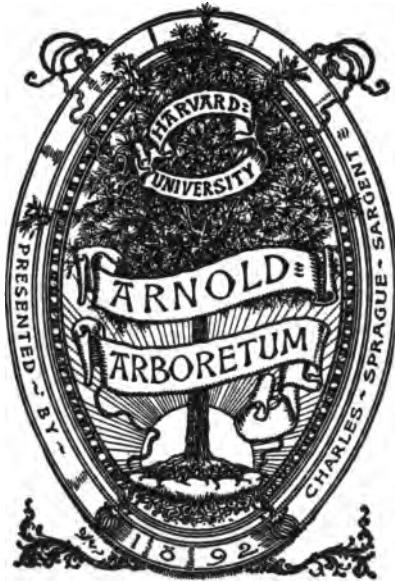
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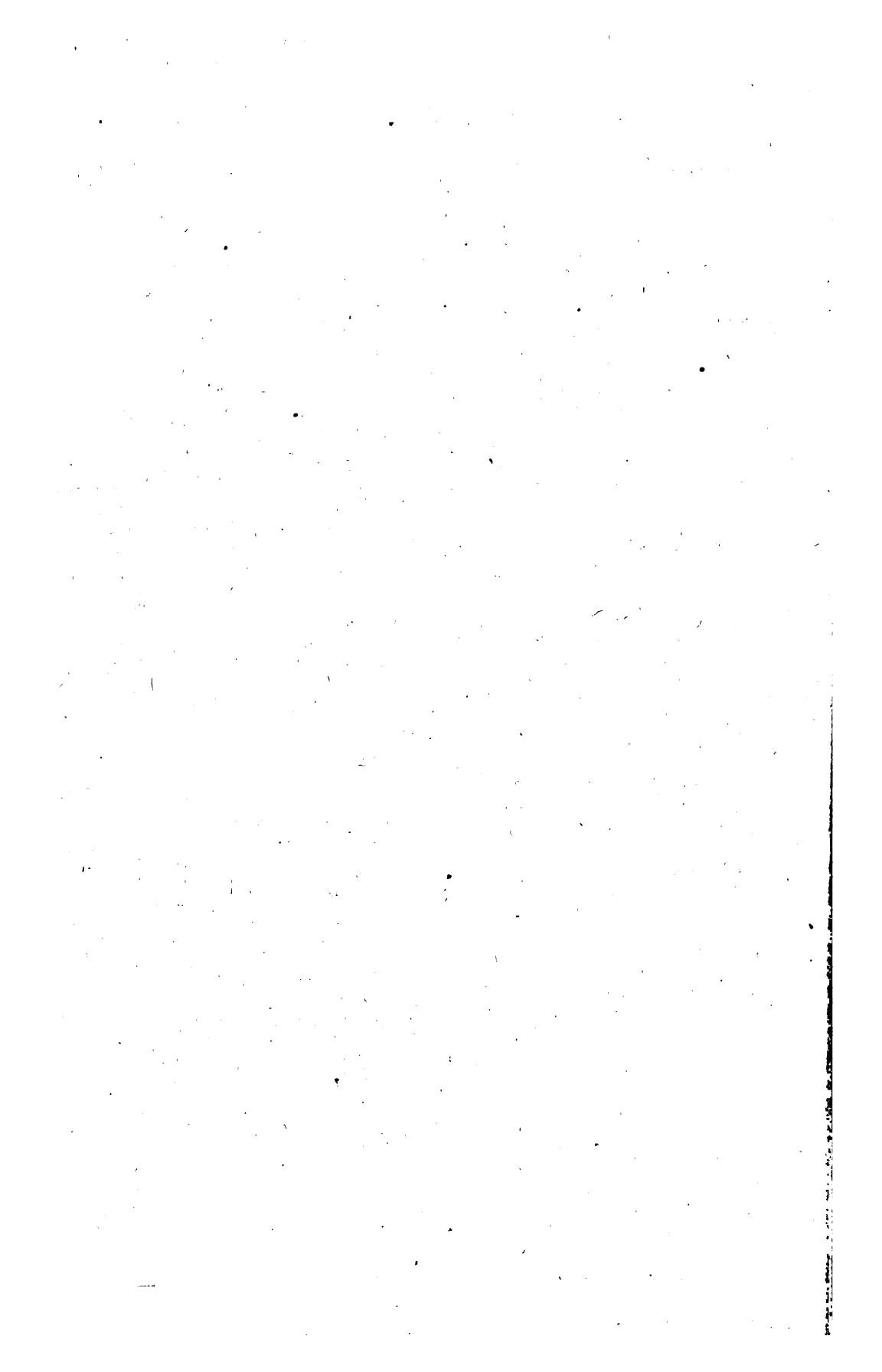
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1963

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MARCH, 1967.



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A PRELIMINARY WORKING PLAN FOR
THE PUBLIC FOREST TRACT OF THE
MINDORO LUMBER AND LOG-
GING COMPANY, BONGA-
BON, MINDORO, P. I.

BY

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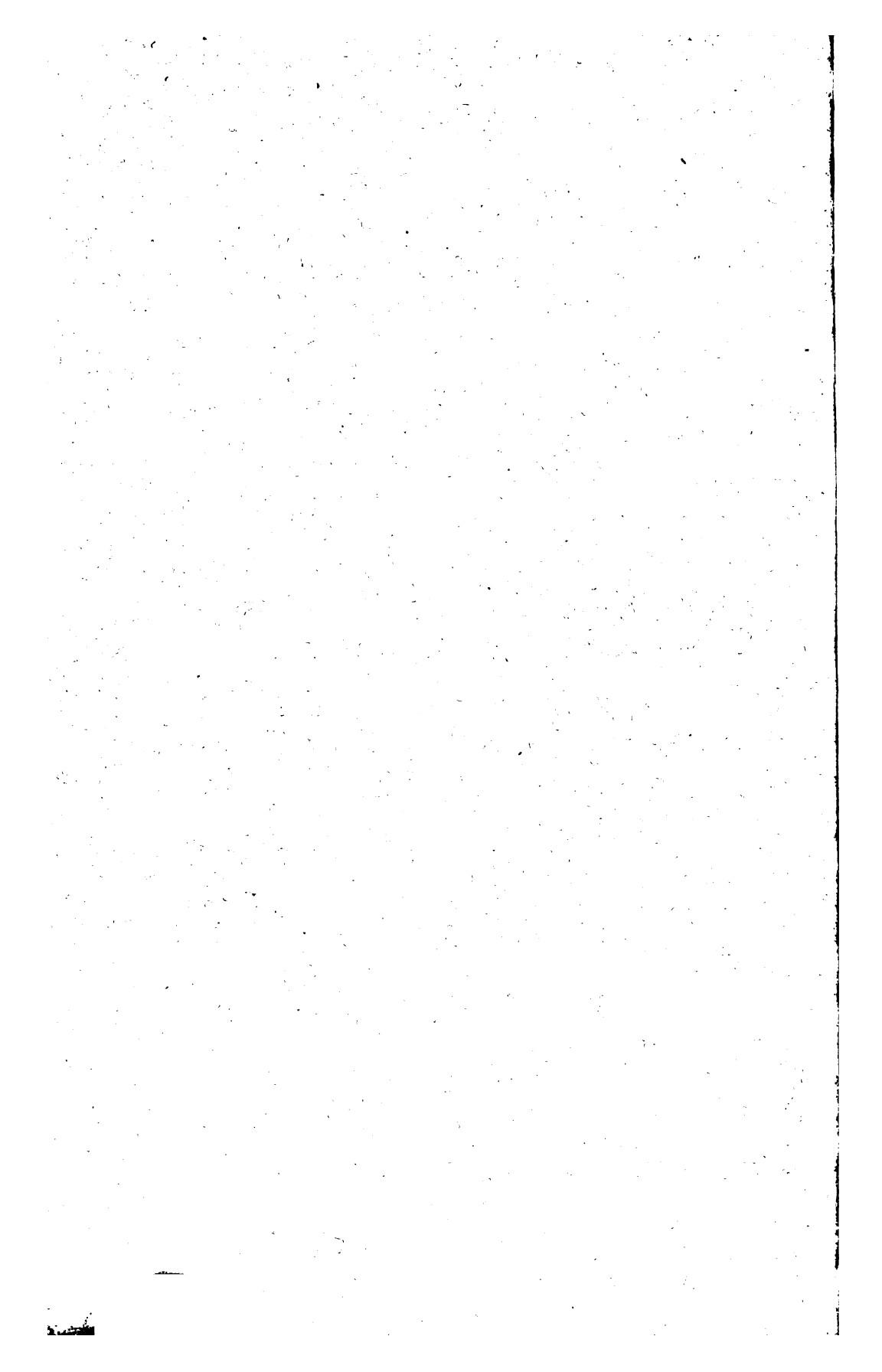


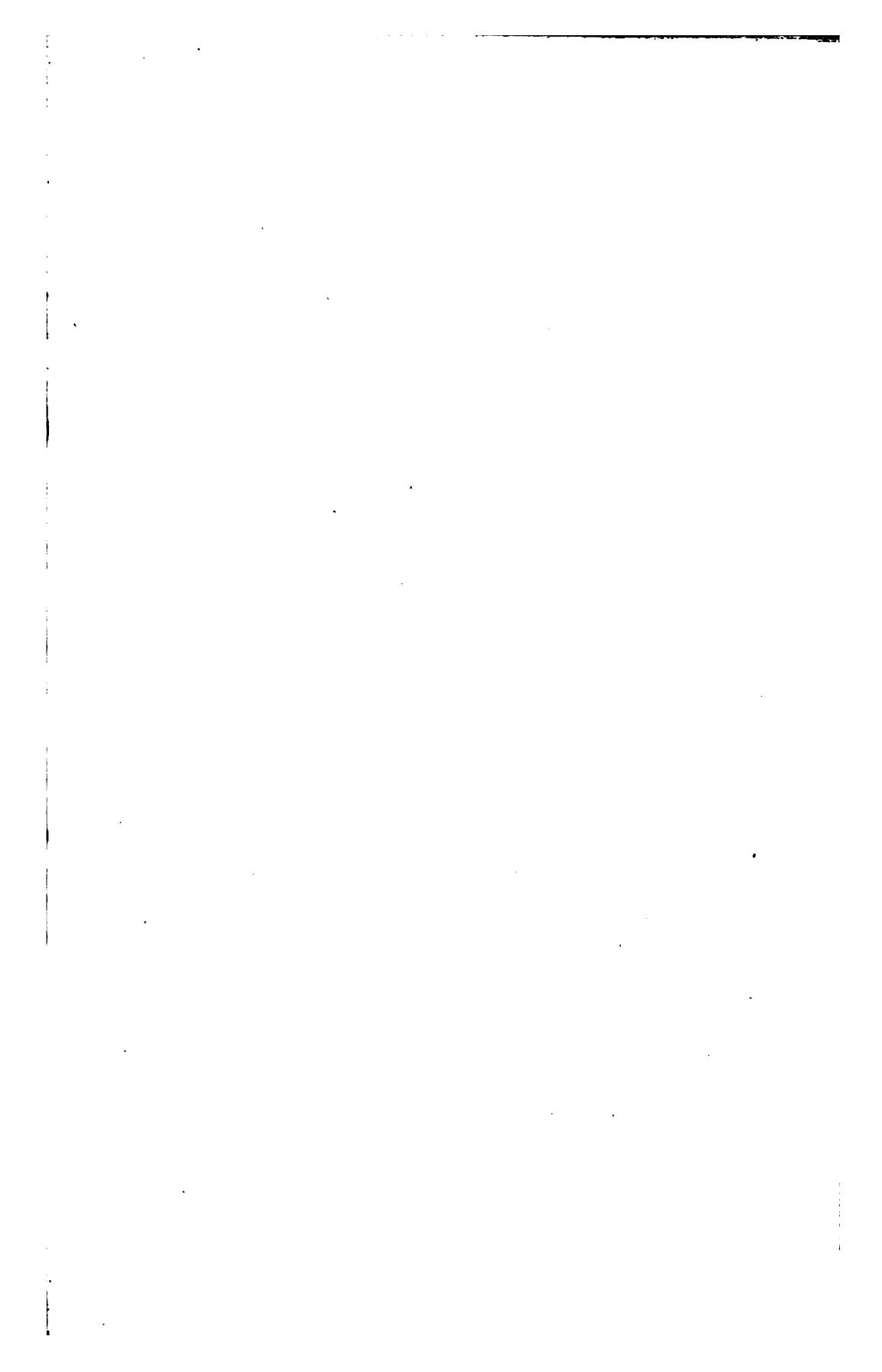
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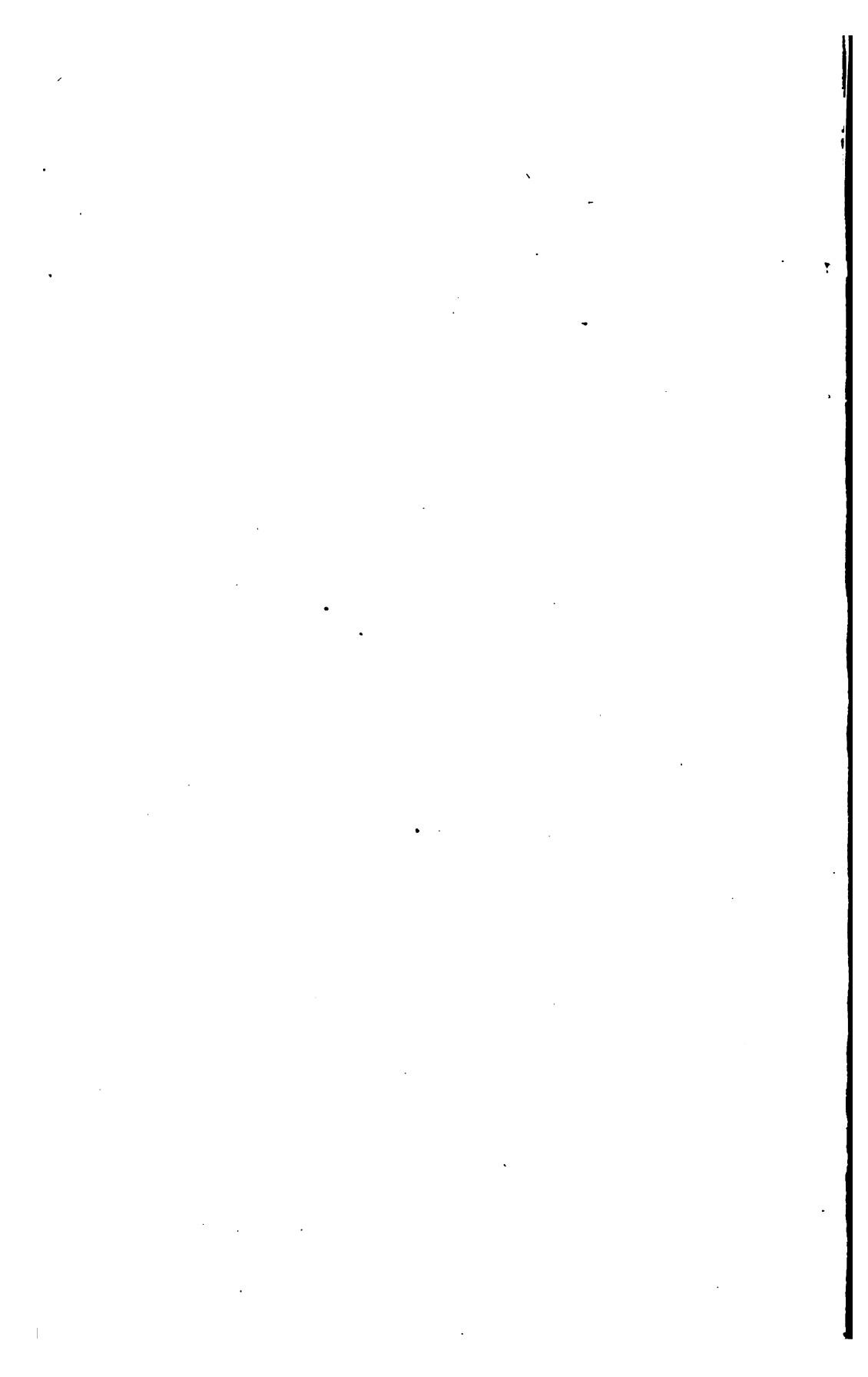
BULLETIN No. 6

MAJOR GEORGE P. AHERN
DIRECTOR OF FORESTRY

MANILA
BUREAU OF PRINTING
1906







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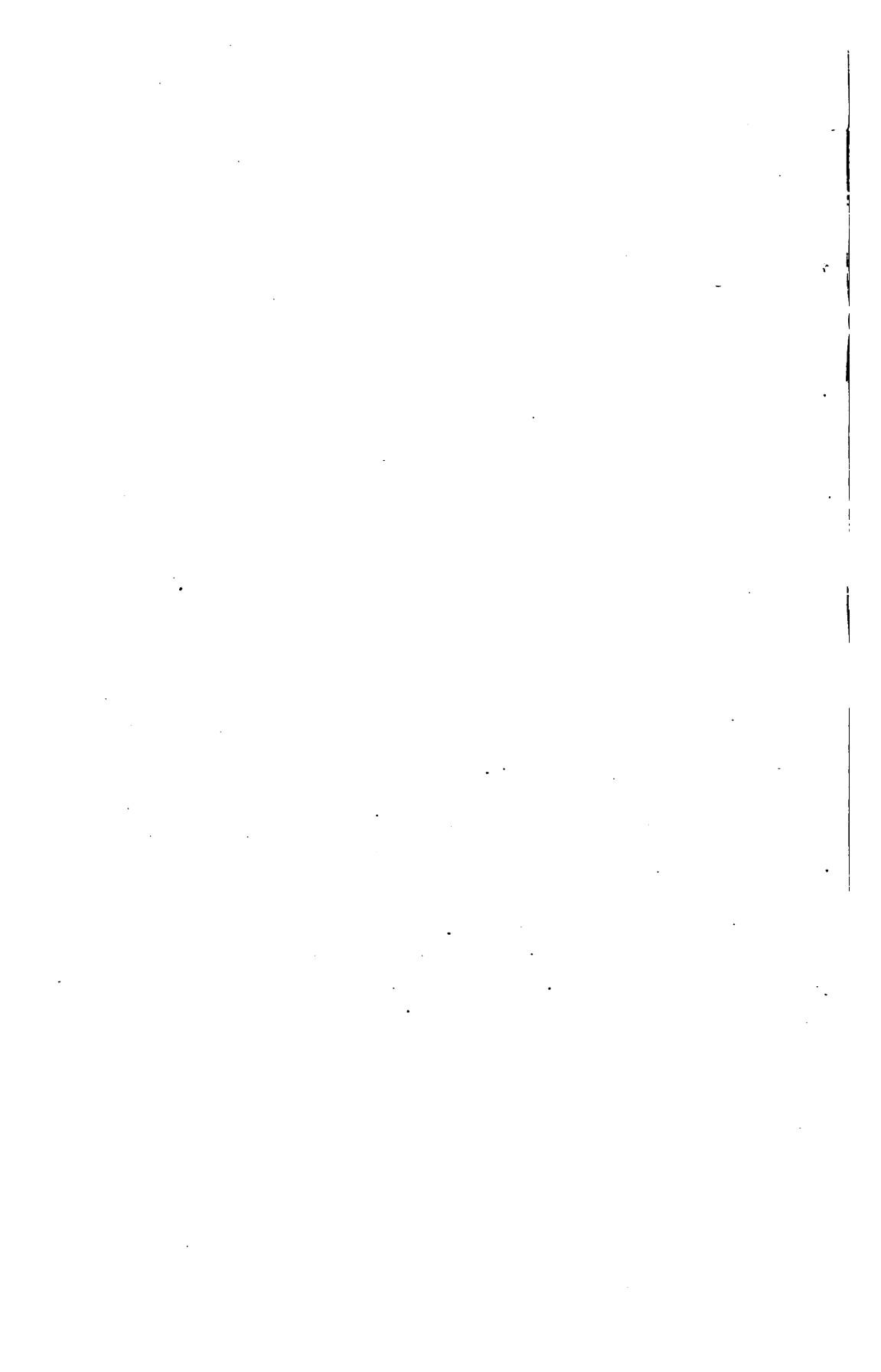
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MAP.

Map of public forest tract between the Sucol and Uasig Rivers, Mindoro, P. I., operated under a twenty-year license agreement by the Mindoro Lumber and Logging Company. (Insert.)



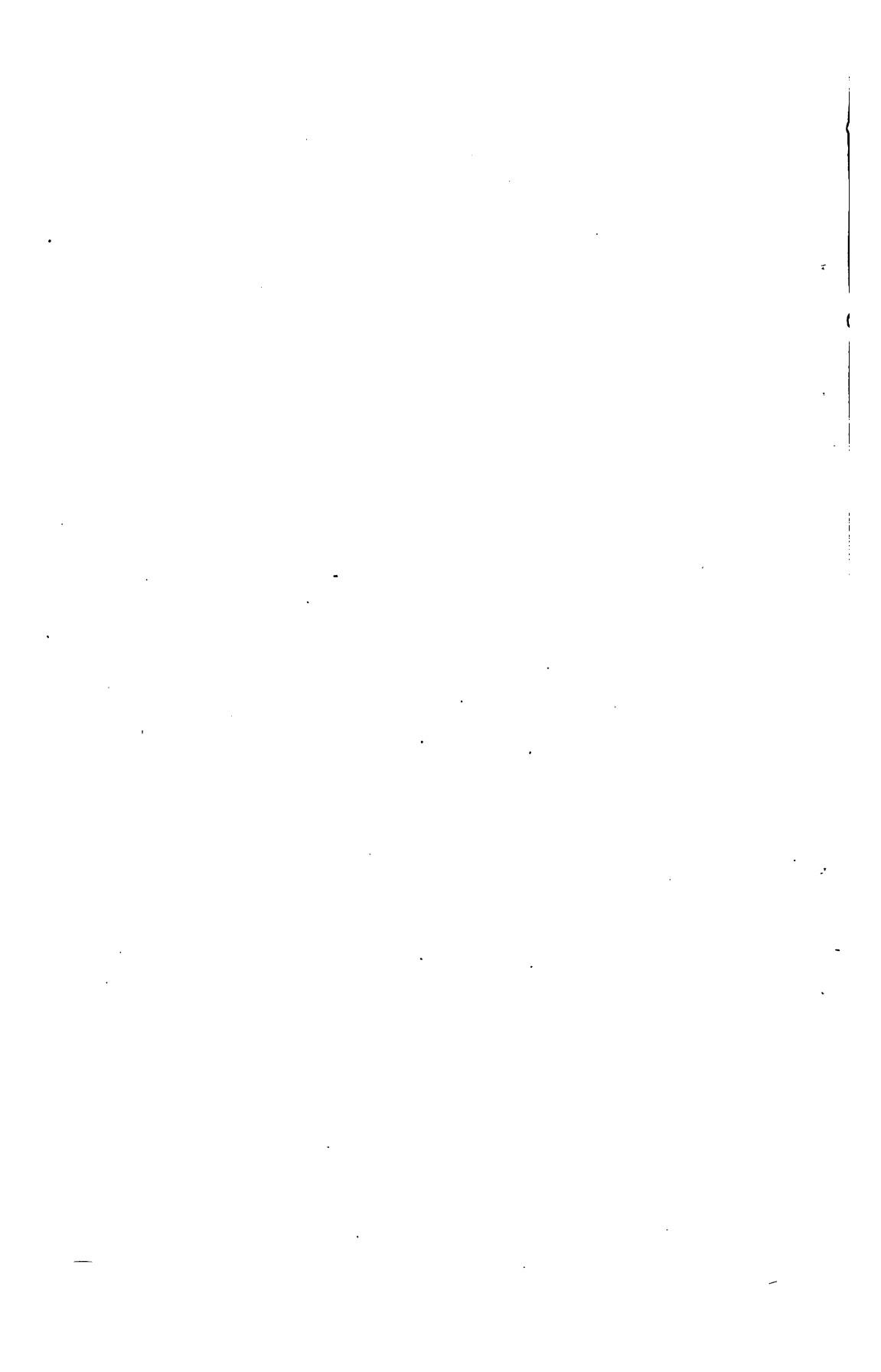
A PRELIMINARY WORKING PLAN FOR THE PUBLIC FOREST TRACT OF THE MINDORO LUMBER AND LOGGING COMPANY, BONGABON RIVER, MINDORO, P. I.

INTRODUCTION.

The territory with which this report deals is held under a twenty-year license agreement by the Mindoro Lumber and Logging Company. This agreement, dated July 3, 1905, gives it "exclusive right to cut, collect, and remove timber, firewood, and bejuco" from the part of the public forest later described, on the condition that it complies with the rules and regulations of the Bureau of Forestry in cutting, collecting, and removing said forest products.

The work upon which this report is based was undertaken for the purpose of forming a preliminary plan of management to be put into operation, pending more complete investigation. Hence the present plan must be looked upon merely as provisional and subject to change when more definite information is obtained.

The field work was done by a party consisting of two foresters, one assistant forester, two native rangers, and from two to nine native laborers, working for a period of over four months. The tract was inspected, surveyed, and mapped, and notes were taken on the distribution of the different types of vegetation. Valuation surveys were then made over approximately 2 per cent of the better part of the forest. The trees were calipered and listed on strips 10 meters wide along lines 500 meters apart. Owing to the poor condition of the rest of the forest, and to lack of time, the remainder of the tract was investigated more hurriedly. While engaged in this survey, an extensive botanical collection was made which is the basis of the scientific nomenclature of this paper.



PART I.

STATEMENT OF THE FACTS UPON WHICH THE WORKING PLAN IS BASED.

GENERAL DESCRIPTION OF THE TRACT.

SITUATION AND AREA.

The tract of land examined lies upon the east coast of the Island of Mindoro, just north of the twelfth parallel of north latitude and east of the one hundred and twenty-first meridian east of Greenwich. The whole tract contains an area of about 85 square miles, while the part surveyed and examined includes approximately 55 square miles.

BOUNDARIES.

According to the terms of the license agreement, the tract is bounded as follows: "From the Sucol River south to the Uasig River, and 10 miles inland." Upon ascending the Sucol River it was found that the native name is changed to Inuman after a short distance, therefore this river has been taken as the north boundary. A short distance inland the Uasig River divides into two branches, a large one known as the Baroc, and a small, nearly dry stream called the Uasig. No investigations were made south of the Baroc branch.

PHYSIOGRAPHY.

As may be seen on the map, the part examined is more or less triangular in shape, having its broadest side toward the coast. Starting at sea level, the land rises slowly and evenly as a broad, flat plain until about 7 miles (11 kilometers) inland it reaches an altitude of nearly 30 meters (100 feet). Here are found a few scattering hills, although the country is still quite level for a short distance more, especially along the Boñgabon River. Back from this flat the foothills rise quickly into the broad and high mountain chain which runs north and south through Mindoro. To the south of the tract the foothills extend almost to the coast. To the north a low and less clearly defined range of hills reach nearly to the beach at a point about 4 miles north of the Sucol River.

The whole territory is drained mainly by the Boñgabon, Dangay, and Uasig Rivers, all of which have rapid currents. The Boñgabon River is the largest of these and flows through a grassy flood plain about half a mile wide. During the wet season this valley is often flooded and the river is practically impassable. At such times there is an abundance of

water for rafting, but the rapid current, which extends far out to sea, would necessitate very strong booms at the mouth of the river to stop logs. The Dangay and Uasig Rivers are smaller and flow through tidal swamps which check their currents. The former could probably be utilized for floating logs for a short distance from its mouth. The Uasig (Baroc) River could also be used in this way a long distance into the interior during the heavy rains, as the river bed is quite free from obstructions.

GEOLOGICAL FORMATION AND SOIL.

The entire flat is probably of delta origin, having been formed by the action of the Boñgabon River. During this formative period there were a number of uplifts that have changed the shore line and the river course from time to time, resulting in the origin of different physiographic units. Corresponding to these there are distinct vegetative types which are adapted to the physical conditions of the topographic units upon which they are found.

The soil is, in general, a deep, fine clay, covered with a thin layer of humus. No underlying rock was found on the flats, although examinations were made in many places from 1 to 2 meters in depth. In the valley of the Bayangan River there is a subsoil of sand or sandy gravel at a depth of from 75 centimeters (30 inches) to 150 centimeters (59 inches) which appears to be more or less continuous. A more shallow sandy subsoil was also found north of the Boñgabon River on the grassy and poorly wooded flats. In almost all places the soil is rich and suitable for agriculture.

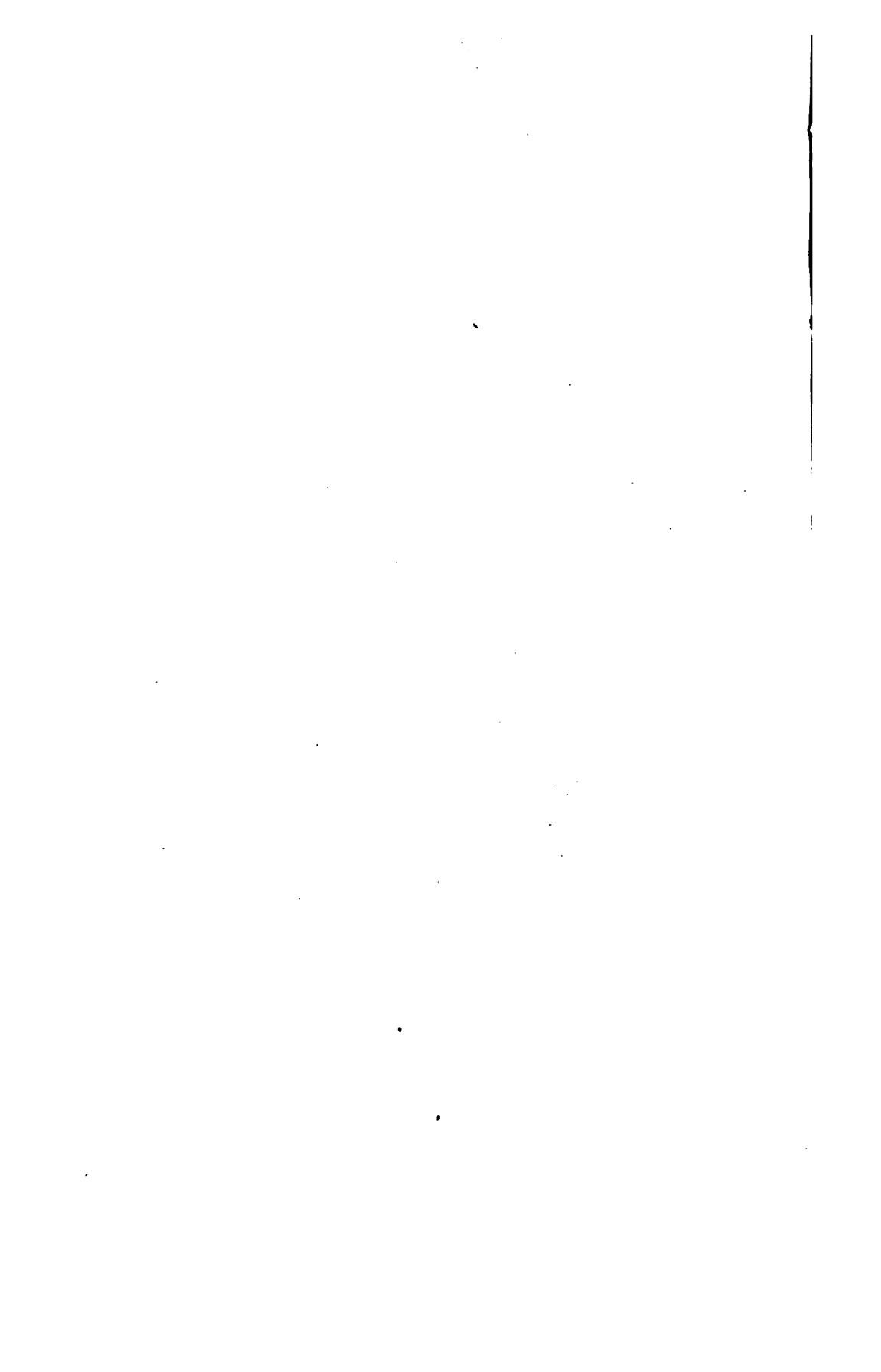
CLIMATE.

Formerly no records either of rainfall or temperature had been taken in Mindoro. The rainfall, however, is heavy and more or less distributed throughout the year. The period of heaviest rain comes during the months of July, August, September, and October, while the lightest is during January, February, March, and April. Notes regarding the rainfall, which were kept from January 16 to March 31, show the following number of rainy days:

Date.	Number of days with heavy rainfall.	Number of days with light rainfall.
January 16 to 31.....	2	5
February 1 to 14.....	0	1
February 15 to 28.....	0	0
March 1 to 14.....	3	6
March 15 to 31.....	0	4

The coolest months are from September to February and the warmest from March to June. Although the warmest months are normally the driest, the northeast monsoon which prevails at this season brings some rain and moderates the heat.





ROADS AND TRAILS.

Extending from the beach just south of the Cauayan River to the saw-mill of the company, about $1\frac{1}{2}$ miles inland, there is a logging tramway, made with wooden rails laid upon cross-ties. Aside from this one tram-road there are only rude trails running through the tract. Nearly all of these are passable for horses or carabaos, although some are merely footpaths through the woods. With the exception of a few rude structures, made only for foot passengers, there are no bridges on the tract.

None of the present trails would be of any value in lumbering except for the passage of laborers and carabaos. All logging roads must be built especially for that purpose. This, however, is easily done outside of the swamps, it only being necessary to clear away the brush and small trees. All such roads are good during the dry and many of them fairly good in the wet season.

SOCIAL AND ECONOMIC CONDITIONS.

According to the last census report, the tract which includes the barrios of Anilao, Masaguisi, and Paclasan supports a population of about 650. In addition, the barrios of Boñgabon to the north and Uasig to the south, which have a combined population of nearly 450, draw approximately half of their support from the tract. The people live in or near villages, around which they practice a rude agriculture, the crops being corn, rice, and vegetables. The only landowners in this territory claiming more than a few acres are a Filipino, who pastures about 300 head of cattle near Paclasan, and an American at the sitio Cupang, who has planted several thousand hemp and cocoanut plants. The Filipinos depend for their forest products upon the forest adjacent to the settlements. They gather resin for torches from Pili and Pagsahiñgin trees, a limited amount of Buri palm leaves for mats, Nipa palm leaves for thatching, and bejucos for rope. The mangrove swamps furnish the firewood, and not much timber is used locally. For the most part these and other needs may be supplied without affecting the virgin forest.

OWNERSHIP OF THE LAND.

Practically all of the second growth and grass lands within a distance of about 2 miles from the coast are claimed by private persons. There are also a number of holdings farther back. None of these have titles, although some have Spanish titles. Practically all of the commercial and uncut noncommercial forest and swamp lands are parts of the public domain. Owing to the fact that no land surveys have been made, it was deemed impracticable to attempt to separate the public from the private lands except in this general way.

COMPOSITION AND CONDITION OF THE FOREST.

CHARACTERISTIC TYPES.

Several distinct natural and artificial types of vegetation are found, due principally to—

- First. The influence of salt water.
- Second. The effect of drainage.
- Third. The action of rivers.
- Fourth. Fire.
- Fifth. The clearing of forests by man.

Sixth. The sylvicultural demands of the different species.

The effect of these factors will be noted as each type is discussed, both for the purpose of showing why that type is present and in order to indicate its possibilities for future development.

Since the vegetation of one type merges gradually into that of another, it has been impossible to fix the boundaries exactly and to locate the areas definitely on the map. The following is the classification, with the estimated per cent, of each type for the portion of the tract surveyed:

Commercial forest areas:	Per cent.
Narra type	10
Hagachac type	15
Mixed type	12
Beach type	1
Total commercial forest	38
<hr/>	
Noncommercial forest areas:	
Guipa type	8
Calaanan type	19
Unclassified	7
Total noncommercial forest	34
<hr/>	
Swamp forest areas:	
Mangrove and Nipa types	11
Buri type	2
Total swamp forest	13
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Other areas:	
Grass land	13
Cultivated land	2
Total	15

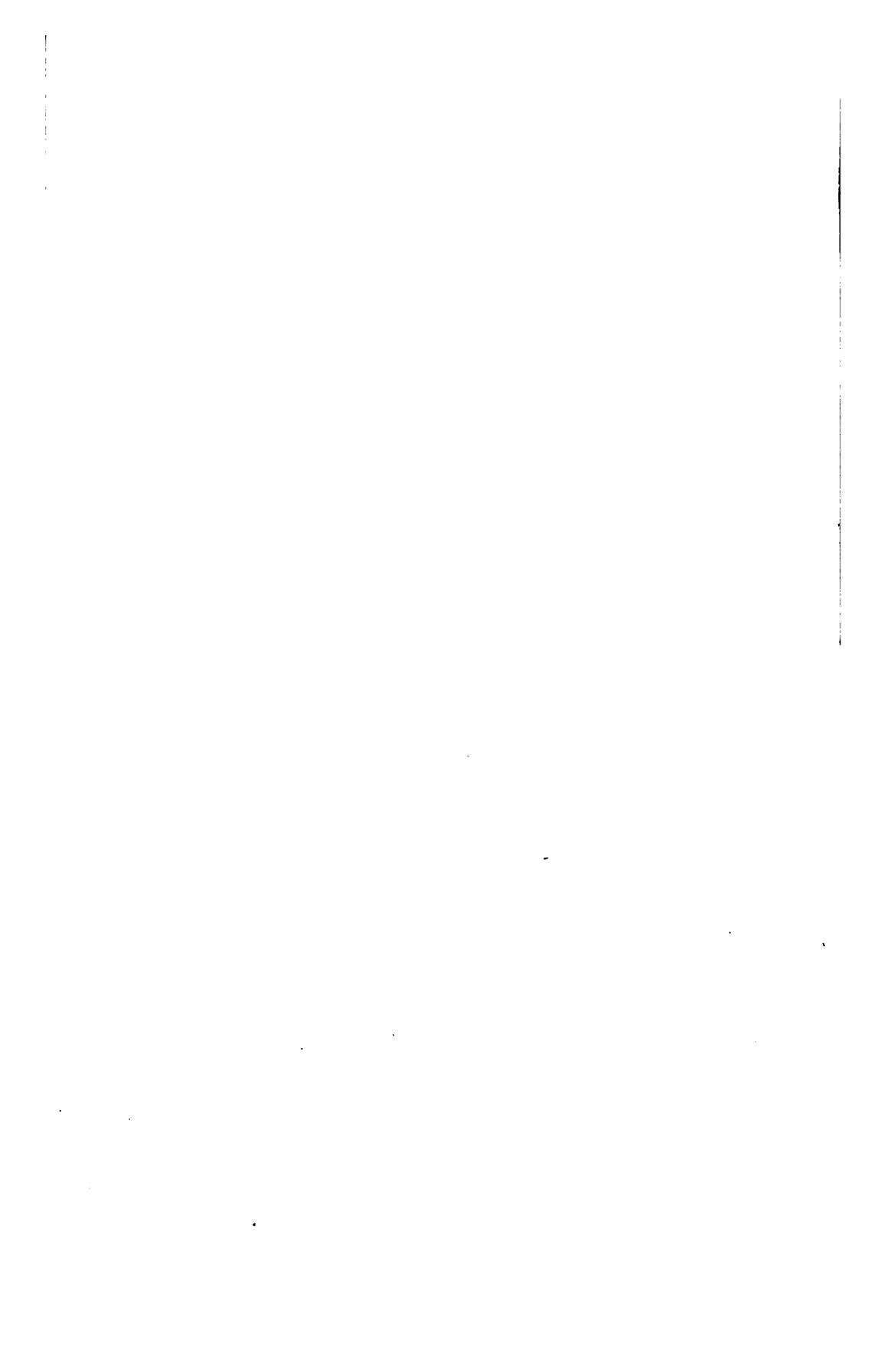
COMMERCIAL FORESTS.

NARRA TYPE.

Most important of all the different types of forest is that in which Narra (*Pterocarpus indicus* Willd.) grows as the characteristic tree. This type extends from the swamp belt near the coast back over the

PLATE III.
Interior view of a Narrra type. The two large trees on the left are Lauan; on the right is Pahutan.





newly made and poorly drained flats until it reaches a higher and better drained soil, where it gradually disappears. Over this tract the abundance of soil moisture and the comparatively open character of the forest furnish the conditions in which Narra reaches its best development.

The general appearance of the forest is much the same throughout. (Pls. II and III.) Usually there are twelve to fifteen large and tall growing trees of perhaps half as many species scattered over an acre. These form a broken upper story to the forest. Scattered in among them are a great many smaller and lower growing or younger trees that fill in the ground space, making a thick under story. Of the smaller trees there are from fifty to seventy species commonly reaching a size of over 10 centimeters (4 inches) in diameter when mature. In addition, there are many that do not reach this size.

Mixed with this lower growth, though often shooting up to greater heights, are numerous palms (Pl. II), while throughout the whole is a mass of climbing bamboo, bejuco (rattan), and other vines that extend to the tops of the tallest trees, as well as over the growth lower down, and often forms dense tangles on or near the ground. Herbs and shrubs are relatively unimportant. Taken as a whole, the under-growth of brush and vines, especially bejuco, is so thick that in walking through the forest it is necessary to use a "bolo" to cut one's way.

Principal species.—Of the trees reaching a diameter of over 40 centimeters (16 inches), Narra constitutes 7.16 per cent. Other timber trees are Lauan (*Shorea contorta* Vidal), 22.23 per cent; Amuguis (*Koordersiodendron pinnatum* Merrill), 7.06 per cent; Guijo (*Shorea guiso* Bl.), 6.37 per cent; Apitong (*Dipterocarpus* sp.), 3.83 per cent; Hagachac (*Dipterocarpus lasiopodus* Perk.), 0.68 per cent, and three species of the genus *Terminalia*, Calumpit (*T. edulis* Bl.), Malagabi (*T. pellucida* Presl.), and Sacat (*T. nitens* Presl.), 1.98 per cent. These trees, which include practically all of the kinds that are lumbered at present, constitute a trifle less than one-half of the whole number which reach a size of over 40 centimeters (16 inches). Of the others, Agupanga (*Chisocheton* sp.), 7.07 per cent, Dao (*Dracontomelum mangiferum* Bl.), 5.10 per cent, and Malaguibuyo (*Celtis* sp.), 4.69 per cent, are most numerous, while the two Canariums—Pili (*C. luzonicum* A. Gray) and Pagsahiñgin (*C. villosum* Bl.), noteworthy because of the fact that they yield resins—make up 1.57 per cent. The remaining 32.26 per cent includes a number of trees, found in small numbers, some of which are valuable. Among these are Bolongeta (*Diospyros pilosanthera* Bl.), Ipil (*Intsia acuminata* Merr.), and Bansilac (*Pithecellobium lobatum* Bth.). The first named is fairly common in many places but does not reach any great size. Other large growing species are Antipolo (*Artocarpus communis* Forst.), Baslayan (*Dehaasia triandra* Merr.), Punghan (sp. of *Lauraceæ*), Taloto (*Pterocymbium tinctorum* Merr.),

Palusat Saling (*Endiandra coriacea* Merr.), Banilad (*Sterculia philippinensis* Merr.), Candol-candol (*Sterculia blancoi* Rolfe), Bancal (*Sarcocapnos cordatus* Miq.), Talimadon (*Gonystylus becanus* Gilg.), Nato (*Palaquium luzoniense* Vi.), Binuang (*Ochroma sumatrana* Miq.), Catmon (*Dillenia philippinensis* Rolfe), and Pahutan (*Mangifera altissima* Blanco).

Minor species.—Butong Manoc (*Cyclostemon microphyllus* Merr.), Putat (*Barringtonia reticulata* Miq. and *B. racemosa* Bl.), and several species each of the genera *Canarium* and *Eugenia* are among the commonest of the smaller growing trees. Near the clearings or in places where there have formerly been clearings are found Tula-tula (*Mallotus floribundus* Muell.), Alom (*Mallotus moluccanus* Muell.), Ylang-ylang (*Canarium odoratum* Baill.), a great many trees of the genus *Ficus*, and others.

Palms.—Growing among the other trees are a large number of palms that seldom exceed 30 centimeters (12 inches) in diameter. The Anahao (*Livistona* sp.) (Pl. II) is widely distributed and grows to a height of 100 feet (30 meters). The Buri (*Corypha umbraculifera* L.) is seldom found except on the borders of the swamps or in very damp places. Boñgan gubat (*Areca whitfordii* Becc.) is confined largely to wet places where the ground water level is very near the surface. Yroc (*Arenga saccharifera* Labill) is scattered quite generally and is a low-growing form found beneath the larger trees. The others, Sarauag (*Pinanga insignis* Becc.), Pugahan (*Caryota* sp.), and Sagasi (*Heterospatha elata* Scheff.) are usually scattered. Table I, which shows the stand of these species, was compiled while taking valuation surveys, and as time was not taken to count all seedlings the number is considerably underestimated. It is, however, approximately correct for the two larger classes:

TABLE I.—Stand of palms per acre (Narra type).

[Average of 70.15 acres.]

Species.	Seedlings (without stems).	Less than 10 meters (33 feet) high.	More than 10 meters (33 feet) high.	Total.
Anahao	9.47	4.97	8.89	18.83
Yroc	8.58	5.81	1.51	15.90
Boñgan gubat	5.07	5.10	2.20	12.87
Sagasi and Sarauag	1.02	1.61	.52	3.15
Pugahan	.56	.91	.28	1.74
Buri	.77	.14		.91
Total	25.46	18.54	8.40	52.40

Soil.—The soil of this type is fairly uniform. It consists of a clay surface soil, more or less mixed with humus 10 to 12 centimeters (4 to 5 inches) in thickness, and a yellowish blue subsoil, which usually extends to the underground water level. In a few places the subsoil is

mixed with sand. As far as investigations show, the underground water level is uniformly 1.5 to 3 meters (5 to 10 feet) below the surface during the dry season, and much above this during the rainy season. It is always sufficiently near the surface to be within reach of the roots of the larger trees, and during extremely wet weather large areas are flooded.

Reproduction.—The dense growth of vines, especially bejuco and bamboo, hinders reproduction. Many of the trees are tolerant and can exist in the forest if the shade is not too heavy. Lauan seedlings (Pl. XII), for instance, may be found in a shade density of 75 per cent. Here the undergrowth is comparatively scarce and open. However, such favorable conditions are scattered through the forest and may be temporary only, for the breaking of limbs or tree tops, due to the wind or the constantly increasing weight of the mass of bejuco and other vines, may bring this tangle of growth in the tree tops to the surface, forming thickets so dense that little or no sunlight can reach the ground. The falling mass may also injure the pole and seedling growth that has already been established. In such a manner, areas in the forest favorable for seedlings are destroyed and the former condition is established only after a number of years. In some places, the leaves of young palms, especially those of Anahao, produce a shade density of almost 100 per cent. For intolerant species, like Narra, reproduction is poor and it is only along trails and in open places that Narra seedlings are found at all. Table II, which shows the number of poles and young trees in the area, is a fair indication of the capacity of the forest to reestablish itself.

TABLE II.—*Stand of poles and small trees per acre on Narra type.*

[Average of 70.15 acres.]

Species.	Diameter.			
	10-19 centimeters (4-7 inches).	20-29 centimeters (8-11 inches).	30-39 centimeters (12-16 inches).	Total.
Narra	0.499	0.470	0.057	1.026
Lauan	2.922	8.150	1.169	7.241
Guijo	.956	1.211	.342	2.508
Amuguis	.713	.570	.427	1.710
Apitong	.884	.698	.228	1.810
Malagabi, Sacat, Calumpit	.142	.214	.042	.398
Hagachac	.156	.128	.071	.355
Pili and Pagsahingin	.769	.912	.285	1.966
Agupanga	1.553	2.309	1.098	4.960
Malaguibuyo	.415	.641	.442	1.496
Dao	.171	.856	.128	.655
Others reaching 30 centimeters (12 inches) in diameter when mature	19.187	17.505	10.806	46.998
Trees not reaching 30 centimeters when mature	28.467	18.048	—	41.510
Total	56.651	41.207	14.595	112.633

Condition.—The sylvical condition of the forest is poor. In it are many over-mature trees that should be removed as soon as possible. This is especially true of Narra. The dense undergrowth renders reproduction difficult.

HAGACHAC TYPE.

On the slightly higher and better drained land adjacent to the Narra forest is a stand of timber which apparently has taken the place of Narra as the river delta has been extended. Contrasted with the Narra forest, the Hagachac type is characterized by the absence of Narra, by the presence of Hagachac (*Dipterocarpus lasiopodus* Perk.) (frontispiece), by a decrease of underbrush, and by an absence of climbing bamboo. While a consultation of the yield tables indicates that the yield is lighter in this than in the previous type, yet virgin stands of the Hagachac type are heavier. The lighter yield shown by the tables is due to the fact that some of the original forest has been cleared or cut over.

Since this type includes several detached areas, it was deemed advisable to distinguish between them for the purpose of calculating the yields separately. The main part of this description, while generally applicable to them all, will be based upon the part designated upon the map as Hagachac I, which is adjacent to the Narra type.

Hagachac Division II does not differ materially from the first except in having a smaller quantity of Guijo. While the average stand is poorer, in some places it is equally as good. Division III of the Hagachac type extends back into the low foothills, in which territory the Mangyanes, a non-Christian tribe, are found. These people have for a long time made their clearings in the forest unrestricted in any way, and have destroyed large amounts of timber. In some places the low hills have been rendered practically valueless from this cause. A single line of survey through this tract, and including a trifle over 19 acres of forest and clearings, shows a yield of approximately 2,300 feet B. M. per acre, about half of which is Hagachac. These figures have not been placed in the tables of stands and yields, as they represent so small a per cent of the forest. Division IV is a small tract of forest which lies just north of the Boñgabon River. It is of about the same grade as Hagachac II, though it has a number of minor differences, due to its proximity to the river and to the surrounding cleared land.

Leading species.—Hagachac makes up 17.45 per cent of the stand of timber trees over 40 centimeters (16 inches) in diameter; Lauan, 18.28 per cent; Amuguis, 6.01 per cent; Guijo, 5.54 per cent; *Terminalia* spp., 1.65 per cent; Narra, 0.95 per cent, and Apitong, 0.23 per cent. In this, as in the Narra type, Lauan is the predominant species, although nearly

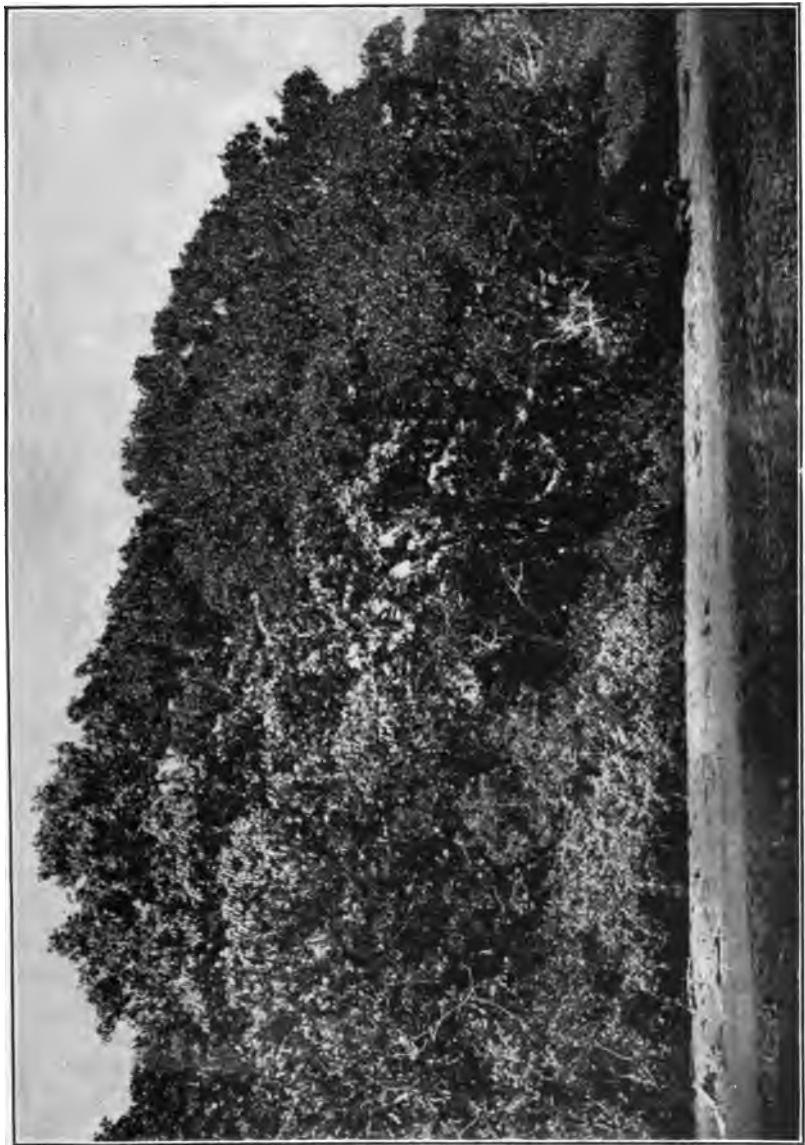
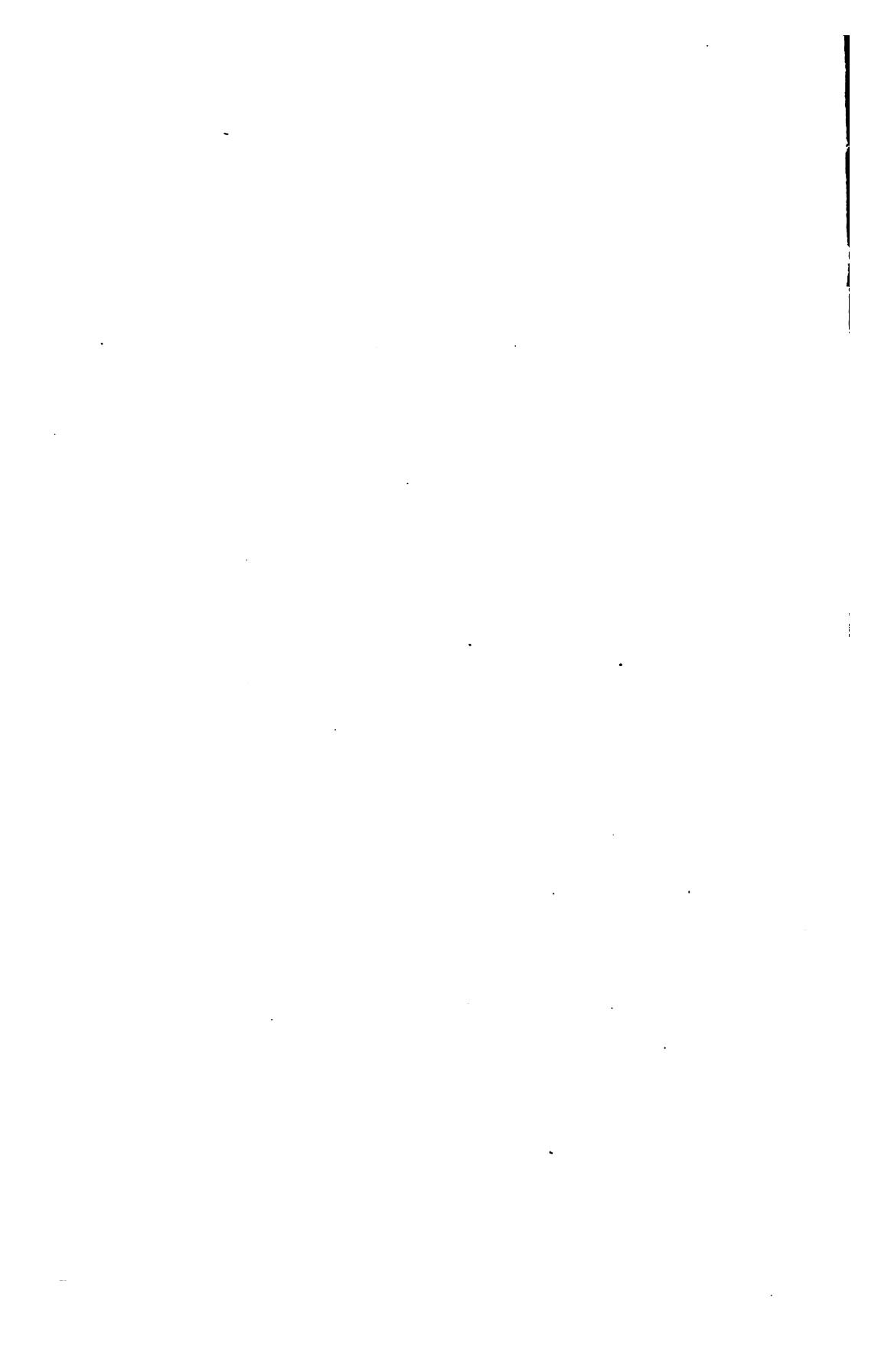


PLATE IV.
View of the beach forest. Palo-maria de la Playa is the common tree here.



equaled by the Hagachac. As a matter of fact, the Hagachac is usually grouped in favorable spots, and in such places greatly outnumbers the Lauan, which is more evenly scattered. It is not uncommon to find groups where the total stand of timber would probably run as high as 20,000 to 30,000 feet B. M. per acre.

Of the other common species, the most numerous with percentages of stand of each are Agupanga, 10.5 per cent; Dao, 6.48 per cent; Malagui-buyo, 5.19 per cent, and Pili and Pagsahiñgin, 2.25 per cent. Of the remaining trees over 40 centimeters (16 inches) in diameter, Malugay (*Dracontomelum* sp.) and Calantas (*Toona* sp.) are found scattered here and there through the forest but are not present in merchantable quantities.

Minor species.—Putat, Bolongeta, and the many species of *Eugenia*, while still found, are not so plentiful as in the Narra forest. Near the Calaanan area there are present many kinds peculiar to that type, especially species of *Ficus* and *Mallotus*.

Palms.—While all the palms growing in the Narra forest are present in this type, the total number per acre is less. Buri and Boñgan gubat are nearly absent; Anahao and especially Yroc are still abundant, and Sarauag, Pugahan, and Sagasi are scattered.

Undergrowth.—Climbing bamboo has practically disappeared and bejuco and other vines, though still common, are not so plentiful in the heavier stands. The smaller growing tree species still continue to form an understory, many of these being found even in the densest places. Shrubs and herbs occur in small numbers, and are relatively unimportant.

Soil.—The soil here is a yellowish clay, sometimes slightly sandy, and has a small amount of humus at the surface. A sandy layer was found at a depth of about 150 centimeters (59 inches) in a few places, but is not universally present. The area, contrasted with the Narra type, is better drained.

Reproduction.—Reproduction is especially good of Hagachac, seedlings, saplings, and poles being common in all places where seed trees are found. No other tree seems to reproduce so well with so little light. The reproduction of Lauan, Amuguis, and Guijo is plentiful except in the more densely shaded places. Table III shows the stand per acre of trees from 10 centimeters (4 inches) to 40 centimeters (16 inches) in diameter. The number of trees in the next to the last column (those over 30 centimeters when mature) is below the actual number. This is due to the fact that it is difficult to properly classify all of these species, no doubtful ones being listed.

TABLE III.—*Stand of poles and small trees per acre on Hagachac type.*

[Average of 84.785 acres.]

Species.	Diameter.			
	10-19 centimeters (4-7 inches).	20-29 centimeters (8-11 inches).	30-39 centimeters (12-16 inches).	Total.
Hagachac	1.756	2.072	1.180	5.008
Lauan	1.497	1.727	.575	3.799
Amuguis .....	.345	.489	.547	1.381
Guijo .....	.575	.575	.288	1.438
Dao .....	.288	.491	.057	.776
Malagabi, Sacat, Calumpit .....	.086	.178	.115	.374
Pili and Pagsahifgin .....	.460	.374	.115	.949
Narra .....	.029	.....	.029	.058
Apitong .....	.057	.086	.....	.143
Agupanga	2.015	2.762	1.698	6.475
Malagubuyyo .....	.201	.488	.575	1.264
Others which will grow to be larger than 30 centimeters (12 inches)	9.828	11.681	4.980	25.989
Total	16.687	20.808	10.159	47.604

Density.—In a typical stand of Hagachac, the high crowns spread over half or often all of the surface. Sometimes, however, the forest is more open than this. In nearly all cases an understory of smaller growing trees gives a comparatively dense ground cover.

Condition.—The silvicultural condition is poor owing to the presence of many over-mature trees, to the unfavorable conditions for reproduction, and to the presence of many inferior species. The merchantable condition is fair.

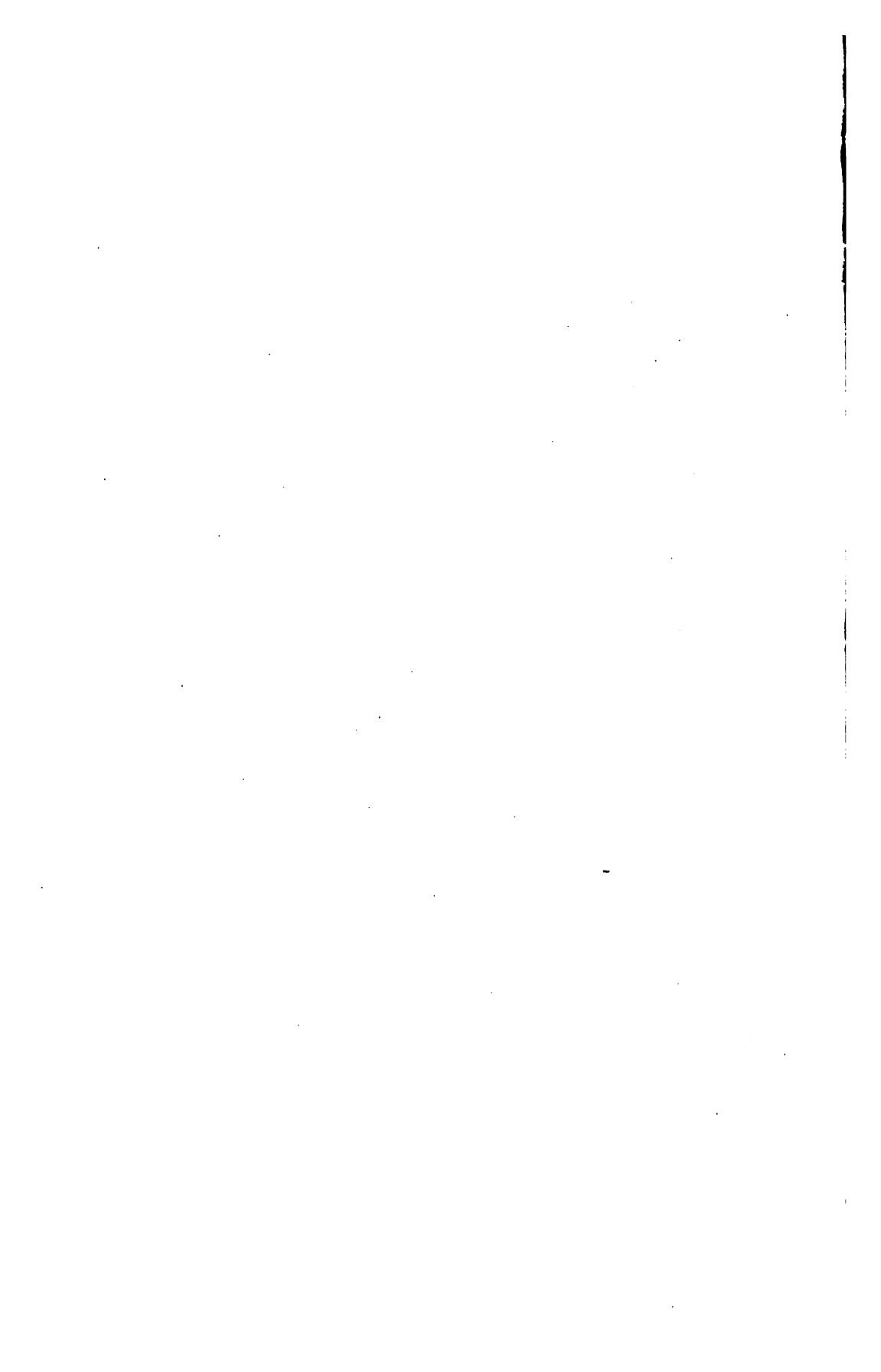
MIXED TYPE.

Situated along the upper waters of the Madugo, Uyao, and Bayangan Rivers is a tract of forest characterized by the absence of both Narra and Hagachac and by a predominance of less important species. The area is flat, rich bottom land, and has a deep clay soil, with a layer of humus at the surface.

The forest is made up of scattering groups or individuals of large and tall growing trees, the most important of which are Lauan, Guijo, and Amuguis. Malugay and Calantas occur in places, while Malagui-buyo, Dao, Agupanga, and Candol-candol are very common. Growing in between and below this upper story of trees are a large number of smaller ones. All through the forest palms are common; especially is this true of Yroc, which grows in fairly dense shade. An abundant growth of vines and bejucos is universally present. The condition of the forest is poor because of clearings, the scarcity of valuable trees, and their poor reproduction.

PLATE V.
Aroho growing along the Rongabon River.





BEACH TYPE.

Since the coastal line of the tract is open and exposed to the direct action of the waves, a narrow beach has been formed, separating the swamp portion from the sea. Near the mouths of the rivers this beach is broader than the average, while in some other especially open places it is being destroyed, thus exposing small patches of the mangrove vegetation which normally lie behind the frontal zone of beach plants.

The forest of the beach is distinct (Pl. IV). Agoho (*Casuarina equisetifolia* Forst.) and the Palo Maria de la Playa (*Calophyllum inophyllum* L.) are the two leading and distinctively characteristic trees. In places, the former grows in nearly pure stands and extends inland along the Boñgabon River (Pl. V) for about a mile. Besides those mentioned, the usual beach plants of the Tropics are found. Among the trees, Botong (*Barringtonia speciosa* Forst.), Dap-dap (*Erythrina indica* Lam.), Talisay (*Terminalia catappa* L.), and Balabago (*Hibiscus tiliaceus* L.) are the more common. Guijo, Amuguis, Apitong, and Ipil are among the timber trees that occur, but not in merchantable quantities, on the landward side of the beach. Pandan (*Pandanus tectorius* Sol.), Cycad (*Cycas circinalis* L.), and many other shrubby plants are found. The Agoho reproduces well and rapidly in most places, but reproduction of Palo Maria is more scattered and in some places entirely absent.

UNCLASSIFIED COMMERCIAL FOREST.

This part of the forest was given very little examination, although it was seen to be of commercial importance. Both sides of the Boñgabon River valley along its upper waters were lined with tree growth. A strip taken to the north at a distance of 9 miles up this river showed a stand in which were found Lauan, Amuguis, some Guijo, and many other large-sized trees. The country here is hilly. An elevation of 260 meters (850 feet) was reached within a mile of the river. Mangyan clearings have destroyed large quantities of timber, and the outlook from this hill and from others indicates that the same conditions exist over the major part of the foothill region, which makes up the back portion of the tract. Logging in this territory is not advisable under present conditions.

NONCOMMERCIAL FORESTS.

In addition to the types of commercial forest already named and described, there are considerable areas covered with tree growth not suited for lumbering under present conditions, and some of it not at all. While a complex classification of this part might be made, the part examined has been divided into two parts and the native names for these used. Naturally, these grade into each other and lines of division are difficult to fix. Fundamentally, however, the distinction between them is clear. The first, or "Guipa" type, is uncut noncommercial forest, containing

many large, though at present noncommercial, varieties of trees. The "Calaanan" type is the second growth forest on land which has been cleared and used for agricultural purposes, and then abandoned.

GUIPA TYPE.

In most cases the Guipa forest appears to be the first high forest growth on areas where the underground water level is very near the surface. Such areas are usually abandoned river channels and flood plains, and, excepting along the Boñgabon River, are very near the coast.

Some idea of the stand and species of the larger trees may be obtained from a rapid count made over 1.7 hectares (4.2 acres) of land in the Guipa south and southeast of the Payang cogonal, where the following are found: Seventeen Dao, 4 Antipolo, 1 Cupang (*Parkia roxburghii* G. Don), 1 Lauan, 1 *Terminalia*, 1 Malaguibuyo, and 1 Bancal, as the more promising of the larger trees. In another place, on an area of 1.6 hectares (3.95 acres) running through the central part of the narrow strip of Guipa between the Anilao River and the barrio of Masaguisi, are found 9 Dao, 3 Amuguis, 5 Toog (*Bischofia trifoliata* Hook.), 3 Bancal, 3 Pagsahingin, 1 Antipolo, 1 Calantas, 1 Narra, 1 Pili, and a few other trees with diameters greater than 40 centimeters (16 inches). These two places represent two of the best portions of the Guipa forest. In both of them, as elsewhere in this type, Catmon in the most characteristic tree, although it rarely reaches a diameter of over 40 centimeters (16 inches).

Palms, especially Anahao and Yroc, are very plentiful. The undergrowth is composed of small trees, vines, and bejuco, and is generally quite dense. Reproduction is fair of the trees present, although in some places the lack of desirable seed trees prevents the reproduction of the better kinds. The soil is rich and varies from a loamy clay to a loamy sand.

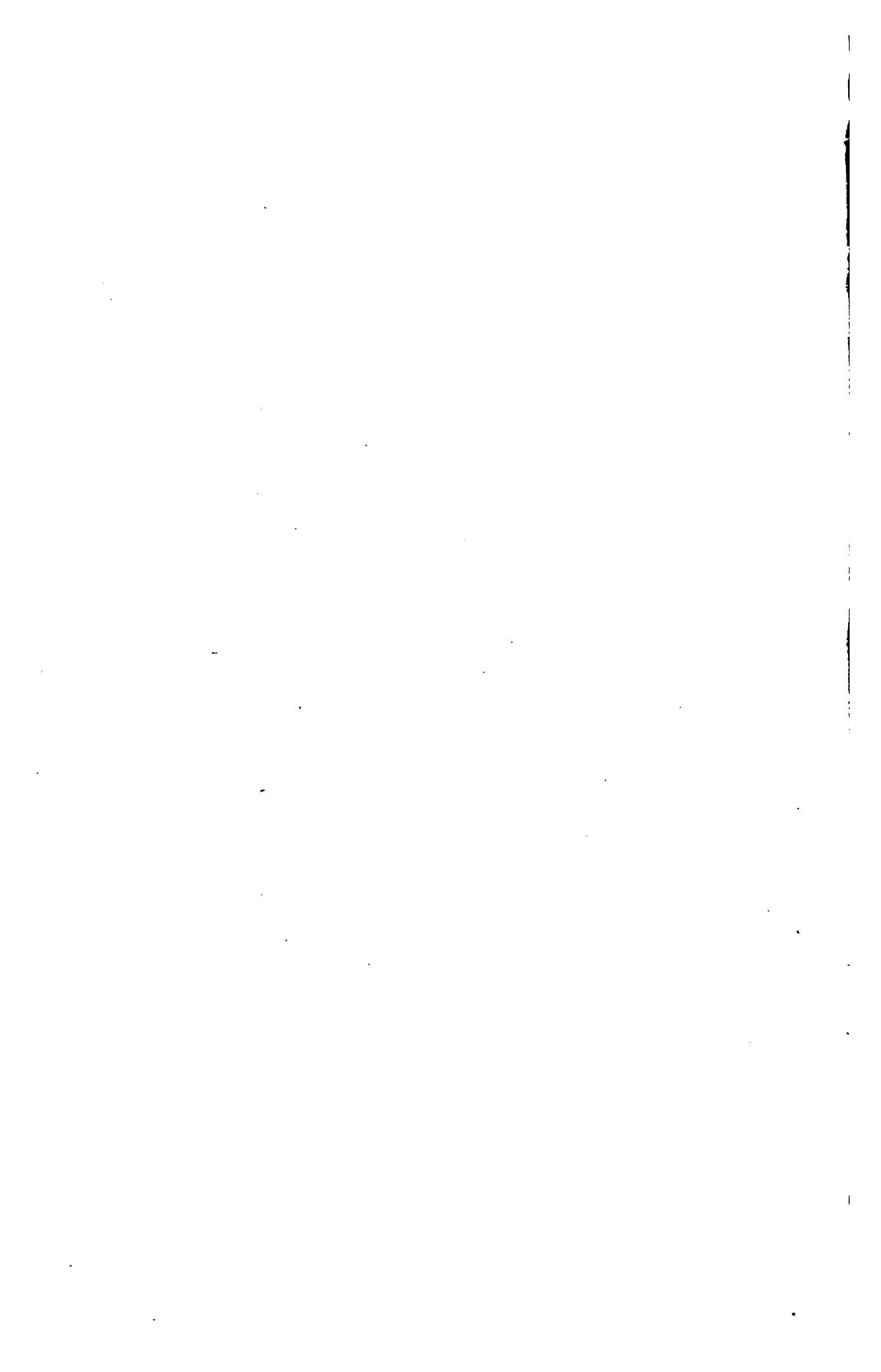
CALAANAN TYPE.

The Calaanan stands in sharp contrast to all of the forest types thus far described (Pl. VI). While the others have been fundamentally natural divisions, this one is distinctly artificial and the direct result of the influence of man. It may be best understood by briefly describing its origin.

A long-standing custom for those raising agricultural crops has been to go into the forest at the commencement of the dry season, cut all of the trees over a small area, and leave them until near the end of the dry season. The slash is then burned, and upon the excellent seed bed left the desired crops are planted. After growing crops for two or three years, the lack of any kind of tools for working the land allows the entrance of weeds, grass, etc., so that it is easier to clear a new place than

PLATE VI.
View of a young Calaanan forest. This is about four months old.





to clean out the old. As a result of these methods, large areas have been cut over, abandoned, grown up, and perhaps cut over again and again. Thus they have been rendered worthless for forest purposes.

The composition of the Calaanen varies considerably in different places. In portions bordering upon or near to the commercial forest, saplings and small poles of adjacent timber species are common. In other places, where the land has been worked for a longer time before abandonment, and where the clearings are near to grass lands, cogon grass (*Imperata exaltata* Brongn.) is mixed with the Calaanen. In still other places there is almost a pure stand of typical Calaanen trees. Taken as a whole, this type is made up of rapid-growing and quick-maturing varieties, which seed abundantly and at an early age. The first to come in, and one of the widest in distribution of these, is Binunga (*Macaranga tanarius* Muell.) (Pl. VI). This seeds at an early age, grows with wonderful rapidity, and while most of the trees die early, some reach the size of forest trees. Commonly growing with this are a number of species of the genera *Mallotus*, *Macaranga*, and *Ficus*.

Table IV gives the number of trees upon a plot one-fortieth of a hectare (one-sixteenth of an acre) taken in the midst of a young Calaanen forest situated so far away from the commercial forest as to be entirely unaffected by it. In this Calaanen there is an unusually large proportion of Binunga and Alom, the former being much the taller, having an average height of 14 meters (45 feet):

TABLE IV.—Number of trees on one-fortieth of a hectare (about one-sixteenth of an acre) of young Calaanen not adjacent to the commercial forest.

Species.	Seedlings less than 1 meter (3 feet) high.	Diameter.				Total.
		1-5 centimeters (1-2 inches).	5-10 centimeters (2-4 inches).	10-15 centimeters (4-6 inches).		
<i>Macaranga tanarius</i> Muell.				43	27	70
<i>Mallotus molluccanus</i> Muell.	1	22	1	1	1	25
<i>Macaranga playfairii</i> Hemsl.		22	2	1	1	25
<i>Ficus hautili</i> Blanco		8	8	3	11	
<i>Leea</i> sp.	2	4	3	3	9	
<i>Ficus mindorensis</i> Merr.	1	3	1	1	5	
All others (8 species)	8	9	1	2	18	
Dead trees		58	21	2		
Total live trees	12	68	54	29	163	

As already stated, Calaanen near the forest usually contains a large number of forest tree seedlings, and would no doubt eventually produce excellent forest if left undisturbed. An old Calaanen near the Narra forest illustrates this point. Table V shows the number of trees found upon two plots, each one-fortieth of a hectare (one-sixteenth of an acre) in area:

TABLE V.—Number of trees on one-twentieth of a hectare (about one-eighth of an acre) of old Calaanen adjacent to the commercial forest.

Species.	Seedlings less than 1 meter (3 feet) high.	Diameter.					Total.
		1-5 centimeters (1 to 2 inches).	5-10 centimeters (2-4 inches).	10-15 centimeters (4-6 inches).	15-20 centimeters (6-8 inches).	20-30 centimeters (8-12 inches).	
Lauan -----	90	19	6	1	-----	-----	56
Guijo -----	27	16	-----	-----	-----	-----	48
Amuguis -----	21	8	1	-----	-----	-----	25
Pahutan -----	2	-----	-----	-----	-----	-----	2
Bancal -----	-----	2	-----	1	-----	-----	3
Pili -----	2	1	-----	-----	-----	-----	3
Ficus (several species) -----	4	10	11	4	4	-----	38
All others -----	71	55	18	3	2	4	158
Total -----	157	106	36	9	6	4	318

The following is a list of trees which are typical Calaanen trees, though they are often found in other forest types:

Ficus minahassae Miq. (Hagimit), *F. hauili* Blanco (Hauili), *F. nota* Merr. (Tibig), *F. variegata* Merr. (Tañisang bayauac T.), *Macaranga tanarius* Muell. (Binuña), *M. bicolor* Muell., *Mallotus barnesii* Merr., *M. playfairii* Hemsl., *M. floribundus* Muell., *M. ricinoides* Muell., *M. moluccanus* Muell. (Alom), *Stylocoryne macrophylla* Bartl. (Basa), *Trema amboinense* Bl. (Knugdon), *Mussaenda grandiflora* Rolfe, *Clérodendron macrostegium* Sch., *Laportea meyeniana* Ward. (Lipa), *Voacanga cumingii* Rolfe, *Phaeanthus cumingii* Miq., *Callicarpa erioclona* Schauer, *C. blancoi* Rolfe, and *C. formosana* Rolfe.

UNCLASSIFIED NONCOMMERCIAL FORESTS.

Two small tracts of forest, one near the Sucol and one near the Uasig River, appear on the map under the above heading. These have not been examined carefully and hence no attempt has been made to classify them. It is believed that the part near the Sucol River contains small areas of commercial forest, otherwise they are apparently made up of a mixture of Guipa, Calaanen, and grass land.

SWAMP TYPES.

MANGROVE TYPE.

Behind the narrow strip of land along the shore that is occupied by the beach forest is a flat area, often quite wide, that is flooded at high tide. Here an excessive amount of salt water gives rise to the so-called mangrove vegetation (Pl. VII), which is composed of a dense stand of trees, from 15 to 30 centimeters (6 to 12 inches) in diameter, and from 8 to 12 meters (26 to 40 feet) in height. Many of these trees have long stilt roots, which form a very characteristic appearance. especially noticeable since the ground is free from undergrowth.

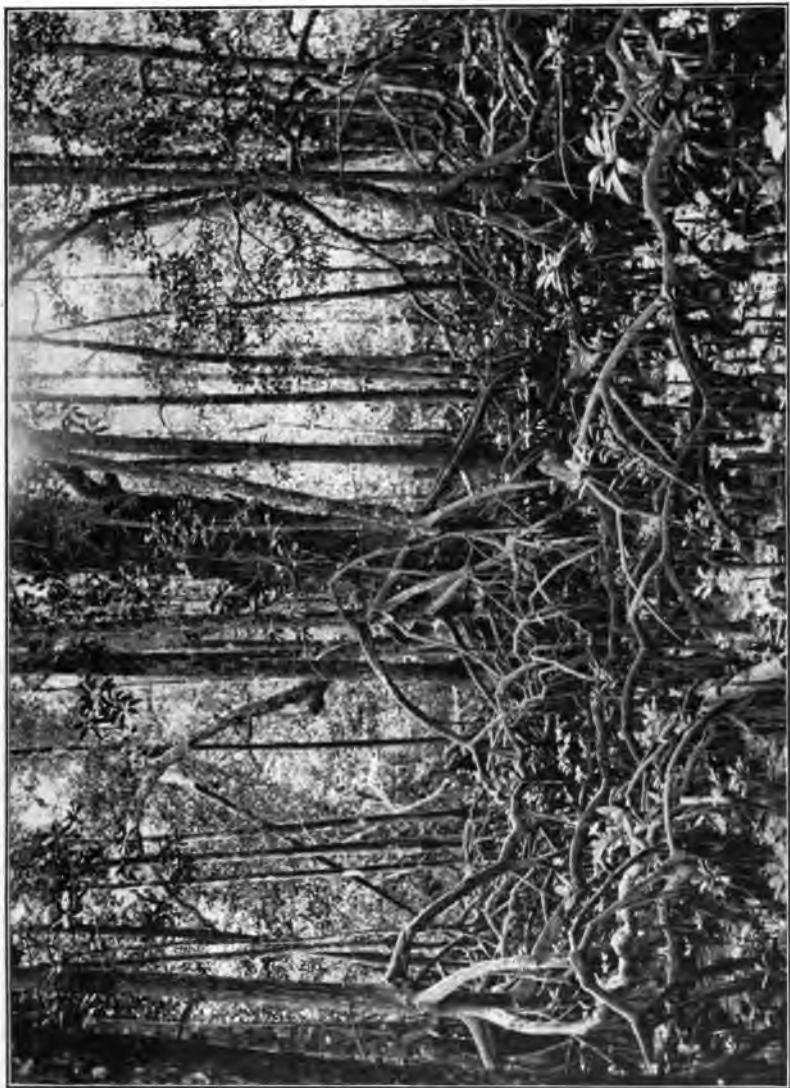
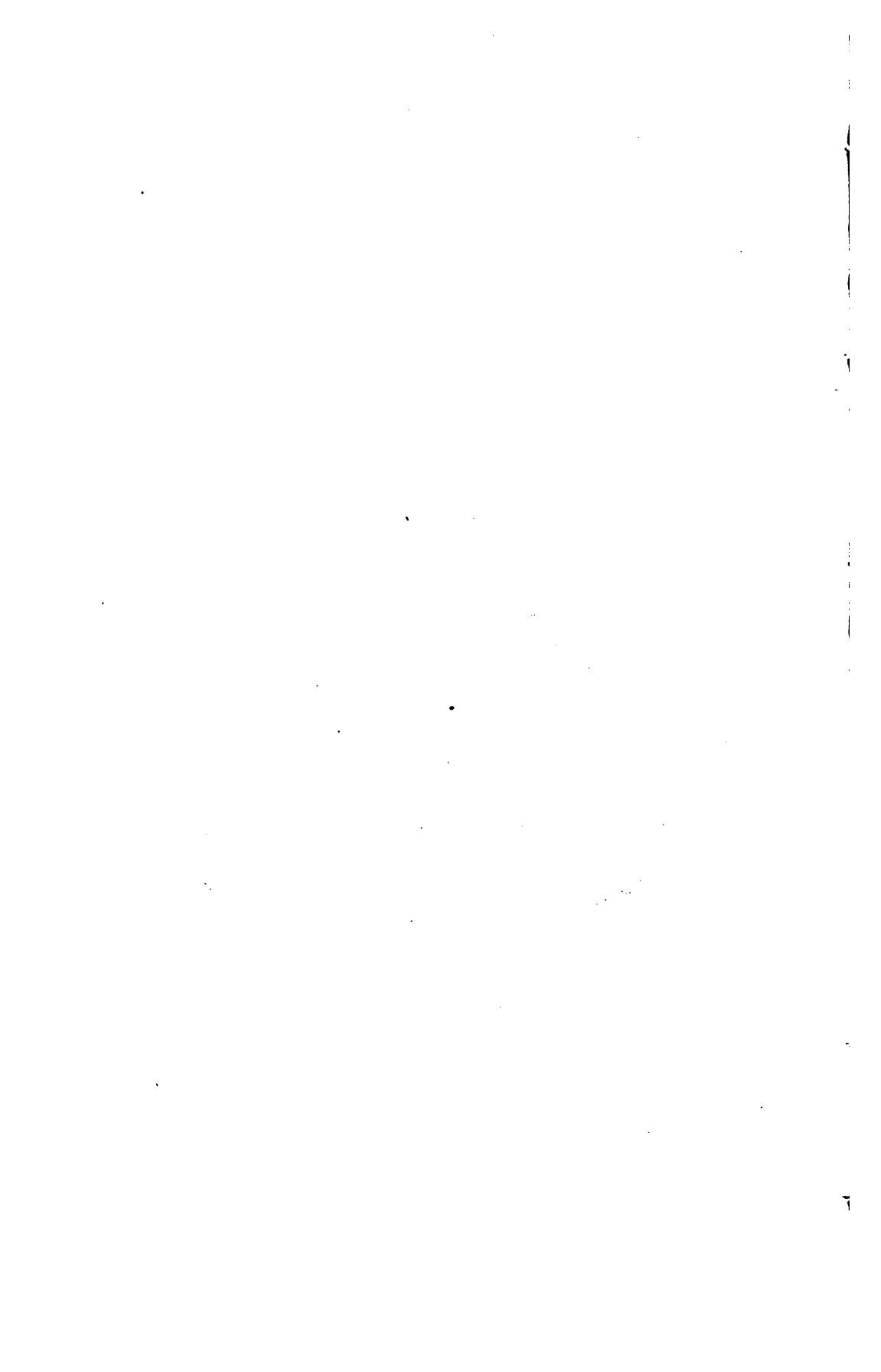


PLATE VII.
Interior view of a Mangrove swamp. The large tree is Pasepat. The trees with prop roots are Bacao (*Rhizophora conjugata*).



Members of the family *Rhizophoraceæ* compose this type almost to the exclusion of all others. The following species are characteristic: *Rhizophora mucronata* Lam., *R. conjugata* L., *Bruguiera gymnorhiza* Lam., *B. parviflora* Lam., *B. eriopetala* Wanda., *B. caryophylliodes* Blume, *Ceriops candelleana* Arn., and *C. roxburghiana* Arn. While the species of *Rhizophora* and *Bruguiera* have the common names of Bacao or Bacauan, and those of the *Ceriops*, Tañgal, these names are often interchangeable and the different species of the genera have such a variety of individual common names that no attempt is made to collect them. Besides the *Rhizophoraceæ*, Pagatpat (*Sonneratia pagatpat* Blanco), Apiapi (*Avicennia officinalis* L.), and Nilad (*Scyphiphora hydrophyllacea* Gaertn.) are present. On the slightly higher areas Tabigue (*Xlyocarpus obovatus* Juss. and *X. granatus* Koenig) and Dungon-late (*Heritiera littoralis* Dry.) are quite common.

The mangrove swamps are important commercially because they are the principal source of firewood in the Philippines and because species of Bacauan, Tañgal, and Tabigue furnish valuable tan barks and dye barks. While in many parts of the Philippines the mangrove swamps have been greatly damaged by long continued cutting, those within this tract are in excellent condition and will furnish, with proper management, a constant supply of firewood, tan bark, and dye bark. Reproduction in them is good since the trees seed continuously and freely.

NIPA TYPE.

Near the upper limit of high tide and on strips along the tidal portion of fresh-water streams the saline condition of the soil is less pronounced. These places are occupied by the Nipa palm (*Nipa fruticans* Wurmb.), which appears as the commonest and characteristic growth. Nipa is often found in nearly pure stands, though occasionally it is mixed with the mangrove species. In the upper limits of the Nipa swamp considerable areas are occupied by the swamp fern, Lagolo (*Achrostichum aureum* L.) and by Doloarin (*Acanthus ilicifolius* L.). The former occurs most frequently. Evidently the Nipa would grow and do well on the land occupied by the mangrove vegetation, but is probably shaded out by it.

BURI TYPE.

Behind the mangrove and nipa swamp is a belt not flooded at any time by the tide, yet containing too much water for the growth of forest trees. Here is usually an almost pure stand of the Buri palm (*Corypha umbraculifera* L.). Toward its higher limits it is mixed with shrubs and forest trees, and merges quickly into forest types. Reproduction is very plentiful, and large numbers of young plants are to be found. The Buri palm is not necessarily confined to the area bordering on the Nipa, but may form dense growth along the streams, especially if these run through or border on the grass areas.

OTHER AREAS.

GRASS LAND.

The broad sandy and rocky flood plain of the Boñgabon River is apparently natural grass land. In places where the action of the floods is strongest, scattered clumps of Talahib (*Saccharum spontaneum* L.) are practically the only vegetation found. Toward the outer edges of the flood plain this grass forms a dense jungle from 2 to 3 meters (7 to 10 feet) in height. Fires sweep through it periodically, partially burning the driest and killing the greenest portions. In this way there has accumulated at the base a dense mass of dead and partially burned grass that is often 1 meter or more in depth, which is sufficient to prevent the seeding of forest trees. In the thinner portions, where the seeding is possible, fires are instrumental in checking forest growth. Mention has already been made of the extension of the coastal belt of Agoho up the Boñgabon River valley. It is believed from observations made in other parts of the Islands that the habitat occupied by the Talahib is especially suited to Agoho, and were it not for fires this tree would form in places pure stands. At the upper limits of the extension of this tree an excellent advance zone of seedlings and young trees was observed. A later visit to the same place showed a fire destroying this stand.

A few ox-bow channels cut off from the main streams are filled with Tagpo (*Phragmites* sp.), and in places there is an extension of the grass zone as peninsulas into the forest, which evidently marked the existence of old river channels. The Baroc River flood plain is similar to that of the Boñgabon River but on a much smaller scale. The banks of all the other rivers are clothed with forest, except where the clearings have allowed cogon to come in. At present these river-bottom grass lands are practically valueless, although they furnish pasturage for such wild game as timarau, deer, and wild carabao.

CULTIVATED LANDS.

Scattered in small areas along roads and trails in almost all parts of the tract are small cultivated fields. These are more numerous near the villages and along the river valleys. In the part of the tract near the mountains the Mangyanes have destroyed large portions of the forest by clearings. The portion of the tract actually under cultivation is estimated at 2 per cent. Since the areas are small, they are not indicated on the map.

STAND.

The stand tables given here for trees over 40 centimeters (16 inches) in diameter were computed for each type separately. Whenever possible, diameters have been taken at breast height, but in case of trees having high buttresses the diameters were taken above the swell.

PLATE VIII.
Narr. Diameter is 200 centimeters. Table tops are made from the large buttresses.



HASACHAC TYPE STAND.

Table VII was computed from surveys made over 34.73 acres (14.057 hectares) or 2.052 per cent of the territory of the part of the Hagachac type designated as Hagachac I, which contains 1,692 acres.

TABLE VII.—Stand per acre on *Hagachac I* type (1,692 acres).

[Average of 34.74 acres.]

Diameter above buttresses.	Haga- chac.	Lauan.	Amu- guis.	Guijo.	Mala- gabi, Secat, Calum- pit.	Pili and Page- hingin.	
Inches.	Centimeters.						
16	40	0.748	0.460	0.290	0.086	0.115	
18	45	.408	.460	.115	.201	.057	
20	50	.374	.575	.115	.086	.057	
22	55	.480	.345	.178	.250	.086	
24	60	.288	.682	.374	.057	.057	
26	65	.280	.374	.144	.086	.029	
28	70	.316	.250	.057	.178	.029	
30	75	.144	.345	.115	.086		
31	80	.280	.178	.029	.029	.029	
33	85	.144	.115	.057	.057		
35	90	.201	.250	.029	.029		
37	95	.144	.178	.029	.029		
39	100	.178	.086		.029		
41	105	.115	.086		.029		
43	110	.057	.029		.057	.029	
45	115	.057	.029		.029		
47	120	.057	.029		.029		
49	125	.029					
51	130	.029					
53	135		.029				
55	140						
57	145						
59	150						
61	155						
63	160	.029					
Total:							
Per acre	4.257	4.458	1.467	1.351	.402	.548	
Per hectare	10.519	11.016	3.625	3.388	.994	1.384	
Percent	17.45	18.28	6.01	5.54	1.65	2.25	
Diameter above buttresses.	Narra.	Api- tong.	Dao.	Agu- panga.	Mala- gibuyo.	All others.	Total.
Inches.	Centimeters.						
16	40	0.029	-----	0.144	0.720	0.173	2.015
18	45	-----	-----	.115	.575	.086	.892
20	50	-----	0.057	.057	.408	.374	.949
22	55	-----	-----	.086	.316	.201	.518
24	60	.029	-----	.280	.316	.115	.345
26	65	.057	-----	.178	.144	.115	.345
28	70	-----	-----	.086	.057	.144	.345
30	75	-----	-----	.029	.029		.115
31	80	.029	-----	.029	-----	.029	.280
33	85	.057	-----	.144	-----		.029
35	90	.029	-----	-----	-----	.029	.115
37	95	-----	-----	.178	-----		.057
39	100	-----	-----	.086	-----		.057
41	105	-----	-----	-----	-----		.057
43	110	-----	-----	.057	-----		.029
45	115	-----	-----	.057	-----		.029
47	120	-----	-----	.086	-----		.029
49	125	-----	-----	-----	-----		.029
51	130	-----	-----	-----	-----		.029
53	135	-----	-----	-----	-----		.029
55	140	-----	-----	.029	-----		.029
57	145	-----	-----	-----	-----		.058
59	150	-----	-----	-----	-----		.057
61	155	-----	-----	-----	-----		.057
63	160	-----	-----	-----	-----		.029
Total:							
Per acre	.280	.057	1.581	2.560	1.266	6.213	24.390
Per hectare	.568	.141	3.907	6.826	3.128	15.852	60.268
Percent	.95	.23	6.48	10.50	5.19	25.47	100

Table VIII is computed from valuation surveys made over 25.11 acres (10.16 hectares) or 1.254 per cent of the territory designated on the map as Hagachac II, which contains approximately 2,000 acres. The scattered and varied condition of this forest is such that the small per cent taken in these surveys must not be accepted as an absolute statement of the stand. It is believed, however, that the actual stand will exceed rather than fall below this estimate.

TABLE VIII.—*Stand per acre on Hagachac II type (2,000 acres).*

[Average of 25.11 acres.]

Diameter above buttresses.		Haga- chac.	Leuan.	Amu- guia.	Guijo.	Dao.	Malagu- buyo.
<i>Inches.</i>	<i>Centimeters.</i>						
16-19	40-49	0.477	0.477	0.318	0.079	0.199	1.991
20-23	50-59	.557	.488	.159	.079	.438	.677
24-27	60-69	.858	.796	.557	.079	.477	.796
28-30	70-79	.557	.278	.477	.040	.398	.288
31-34	80-89	.278	.159	.079	.040	.288	-----
35-38	90-99	.238	.119	.119	.040	.159	-----
39-42	100-109	.018	.040	.079	-----	.159	-----
43-46	110-119	.040	.040	-----	-----	-----	-----
47-50	120-129	.119	.040	-----	-----	.079	-----
Total:							
Per acre	2.942	2.887	1.788	.857	2.147	8.702	
Per hectare	7.270	5.898	4.418	.882	5.805	9.148	
Per cent	13.60	11.08	8.26	1.65	9.92	17.11	
Diameter above buttresses.		Agu- panga.	Candol- candol.	Mala- gabi, Sacat, Calum- pit.	Others.	Total.	
<i>Inches.</i>	<i>Centimeters.</i>						
16-19	40-49	1.353	0.597	-----	1.283	6.724	
20-23	50-59	.886	.517	0.079	.717	4.497	
24-27	60-69	.517	.199	-----	.697	4.416	
28-30	70-79	.040	.119	.119	.567	2.828	
31-34	80-89	.040	-----	.079	.278	1.191	
35-38	90-99	-----	-----	.040	.199	.914	
39-42	100-109	-----	-----	-----	.079	.675	
43-46	110-119	-----	-----	-----	.040	.120	
47-50	120-129	-----	-----	-----	.040	.278	
Total:							
Per acre	2.786	1.482	.817	3.780	21.638		
Per hectare	6.884	3.539	.788	9.340	58.467		
Per cent	12.88	6.62	1.46	17.47	100		

MIXED TYPE STAND.

Table IX is computed from valuation surveys made over 34.7 acres (14.07 hectares) or 0.82 per cent of the total area for this type, which is approximately 4,200 acres. The variable character of this forest is such as to render this small per cent insufficient data for certain conclusions. The general stand is poor and the forest more or less mixed with clearings and Calaanan. More complete data would no doubt show a considerable variation from these figures.

TABLE IX.—Stand per acre on mixed type (4,200 acres).

[Average of 34.7 acres.]

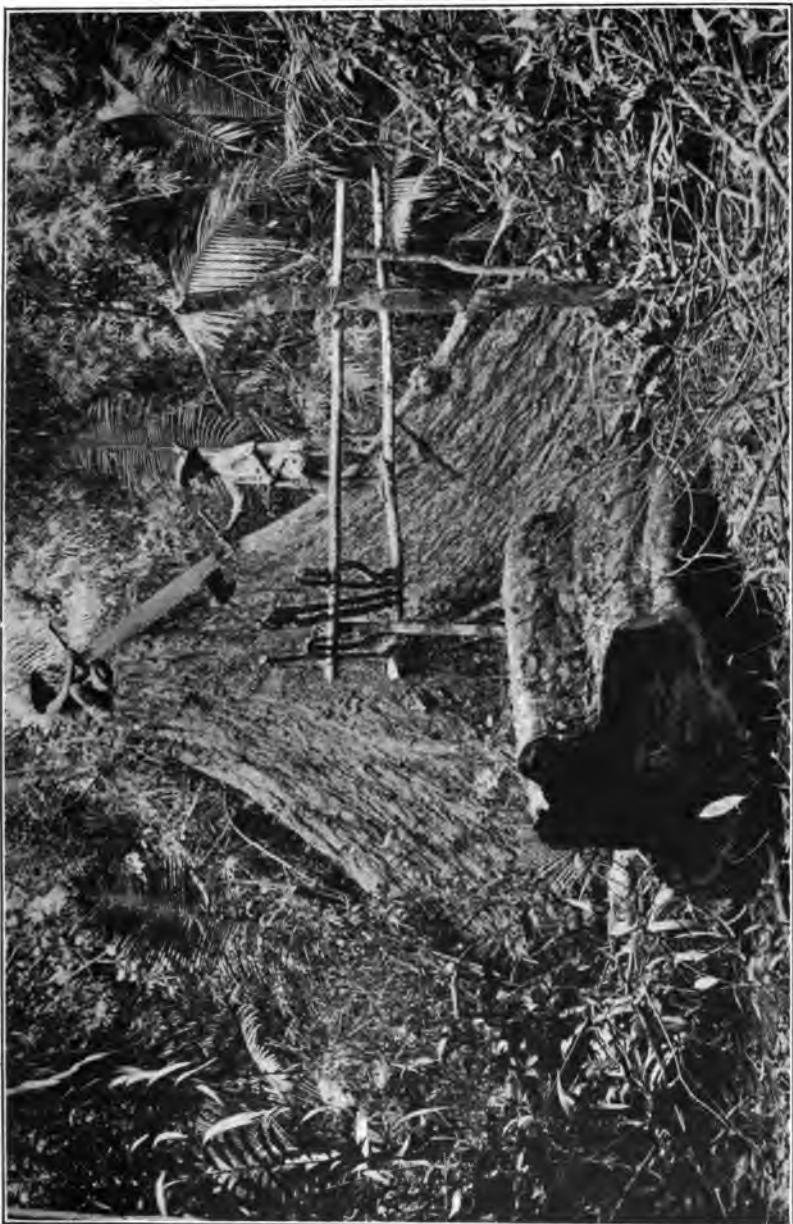
Diameter above buttresses.		Lauan.	Amu-guis.	Guijo.	Dao.	Mala-gabi, Sacat, Calum-pit.
<i>Inches.</i>	<i>Centimeters.</i>					
16-19	40-49	0.403	0.280	0.280	0.028	0.115
20-23	50-59	.720	.259	.201	.288	—
24-27	60-69	.683	.280	.086	.259	.144
28-30	70-79	.259	.115	.259	.816	.086
31-34	80-89	.817	.172	.201	.259	.028
35-38	90-99	.057	—	.057	.057	—
39-42	100-109	.057	.057	.057	.316	.028
43-46	110-119	—	—	—	.086	—
47-50	120-129	.057	—	—	.086	—
Total:						
Per acre	—	2.503	1.063	1.091	1.695	.401
Per hectare	—	6.185	2.627	2.696	4.188	.991
Per cent	—	15.80	6.71	6.89	10.70	2.53
Diameter above buttresses.		Malaguibuyo.	Agu-panga.	Others.	Total.	
<i>Inches.</i>	<i>Centimeters.</i>					
16-19	40-49	1.555	0.748	1.296	4.605	—
20-23	50-59	.748	.431	1.123	3.770	—
24-27	60-69	.662	.374	.691	3.079	—
28-30	70-79	.230	.201	.408	1.869	—
31-34	80-89	.086	.028	.345	1.436	—
35-38	90-99	—	—	.028	.199	—
39-42	100-109	—	—	.144	.659	—
43-46	110-119	—	—	—	.086	—
47-50	120-129	—	—	—	.143	—
Total:						
Per acre	—	3.281	1.782	4.080	15.846	—
Per hectare	—	8.107	4.408	9.958	39.155	—
Per cent	—	20.70	11.24	25.43	100	—

VOLUME TABLES.

Owing to the fact that almost no cutting was going on during field work on the tract, very few measurements of felled trees were made. These volume tables have been computed largely from data taken by Forester Everett in Negros, Forester Maule in Bataan, and Forester Klemme in Tayabas, and checked with a few measurements taken upon the tract. In every case, however, it has been the purpose to make conservative estimates. Three tables are given, one for Narra, a low-growing tree; one for Amuguis and species of *Terminalia*, which are of medium height; and one for *Dipterocarpaceæ*, which includes Lauan, Apitong, Guijo, and Hagachac. The latter trees are tall growing, and, while they differ from each other, it was thought best to use one table for them all. A comparison of this latter table with that given for the Yellow Poplar¹ (*Liriodendron tulipifera* L.) of the United States, which very much resembles in general form and habits of growth these *Dipterocarps*, shows a marked similarity between the two.

¹ See Braniff, E. A.: Grades and Amounts of Lumber Sawed from Yellow Poplar, etc. U. S. Dept. of Agriculture, For. Ser., Bull. 73 (1906).

PLATE IX.
Stump of a large Narra tree. Note the buttress, and the shape of the Narra log.



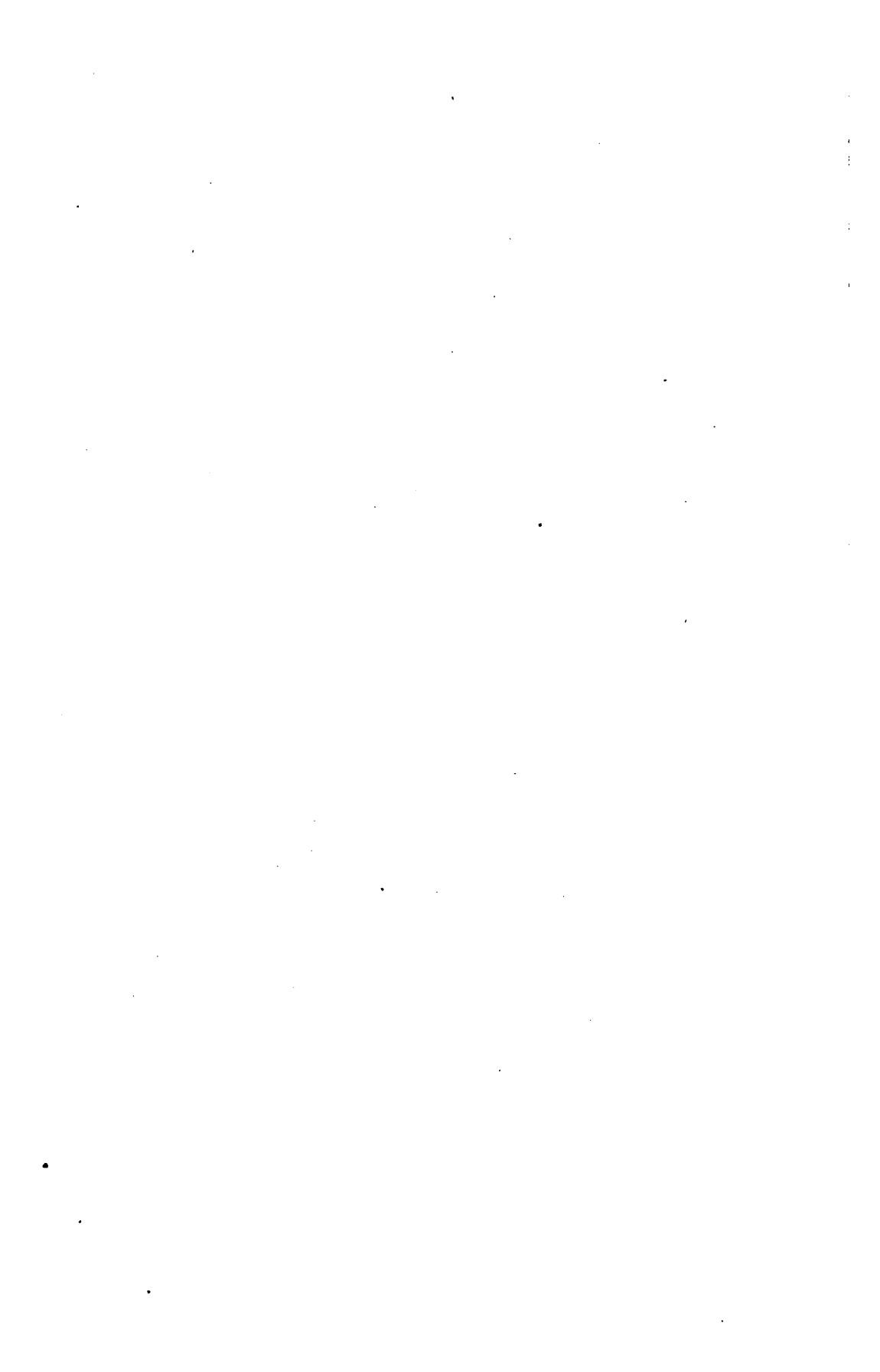


TABLE X.—*Volume table.*

Diameter.		Narra.		Amuguis, Malagabi, Sacat, Calumpit.		Lauan, Guijo, Hagachac, Apitong.	
		Board feet Doyle.	M ³	Board feet Doyle.	M ³	Board feet Doyle.	M ³
<i>Inches</i>	<i>Cm.</i>						
16	40	140	0.500	210	0.875	210	0.875
18	45	195	0.745	285	1.150	285	1.110
20	50	235	1.005	350	1.420	390	1.725
22	55	300	1.320	416	1.775	446	2.250
24	60	370	1.556	506	2.200	680	3.150
26	65	450	1.950	622	2.550	910	3.640
28	70	550	2.275	760	2.920	1,170	4.815
30	75	650	2.540	885	3.310	1,380	5.110
31	80	740	2.955	1,045	3.870	1,615	6.000
33	85	821	3.250	1,200	4.310	1,804	6.850
35	90	915	3.625	1,360	4.750	2,116	7.650
37	95	1,010	3.950	1,465	5.320	2,420	8.325
39	100	1,115	4.350	1,640	5.901	2,685	8.900
41	105	1,220	4.800	1,820	6,300	2,982	9.540
43	110	1,310	5.200	1,985	6,595	3,200	10.276
45	115	1,430	5.560	2,160	6,980	3,450	10.900
47	120	1,550	6.200	2,375	7,350	3,685	11.500
49	125	1,622	6.620	2,600	7,500	3,966	12.120
51	130	-----	-----	-----	4,215	12.500	
53	135	-----	-----	-----	4,500	13.00	
55	140	-----	-----	-----	4,650	13.00	

YIELD.

The yield tables have been computed for each type separately by applying the proper volume table to the number of trees of each diameter class which was found upon that type. While the yields can not be accepted as being accurate, owing to the nature of the volume tables used, it has been thought advisable to include them as being a conservative estimate of the yield.

TABLE XI.—*Yield in board feet on Narra type (3,447 acres).*

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches).	
	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
Narra-----	1,249	4,305,303	1,224	4,219,128
Lauan-----	6,855	23,629,185	6,582	22,515,804
Guijo-----	1,582	5,458,154	1,450	4,998,150
Apitong-----	1,200	4,136,400	1,150	3,964,050
Amuguis-----	1,260	4,348,220	1,188	4,095,086
Malagabi-----	408	1,406,376	385	1,327,095
Sacat-----				
Calumpit-----				
Hagachac-----	285	982,395	272	987,584
Total-----	12,839	44,256,033	12,201	42,056,847
Per hectare-----	31,725	-----	30,148	-----

TABLE XII.—Yield in cubic meters on *Narra* type (1,895 hectares).

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches).	
	Average yield per hectare.	Total yield.	Average yield per hectare.	Total yield.
<i>Narra</i>	12.50	17,427.50	12.28	17,180.60
<i>Lauan</i>	62.55	87,257.25	59.08	82,346.85
<i>Guijo</i>	14.90	20,785.50	18.46	18,776.70
<i>Apitong</i>	11.03	15,386.85	10.49	14,683.55
<i>Amuguis</i>	12.08	16,851.60	11.86	15,847.20
<i>Malagabi</i>				
<i>Sacat</i>	8.75	5,281.25	8.52	4,910.40
<i>Calumpit</i>	2.89	3,384.05	2.24	3,124.80
<i>Hagachac</i>				
Total	119.20	166,284.00	112.88	156,770.10
Per acre	48.24	-----	45.48	-----

TABLE XIII.—Yield in board feet on *Hagachac I* type (1,692 acres).

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches.)	
	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
<i>Hagachac</i>	4,815	8,146,980	4,548	7,686,756
<i>Lauan</i>	4,526	7,657,992	4,298	7,272,216
<i>Guijo</i>	1,497	2,582,924	1,421	2,404,332
<i>Amuguis</i>	798	1,850,216	711	1,203,012
<i>Malagabi</i>				
<i>Sacat</i>	198	385,016	158	267,886
<i>Calumpit</i>				
<i>Narra</i>	135	228,420	131	221,652
<i>Apitong</i>	22	37,224	22	37,224
Total	11,991	20,288,772	11,284	19,092,528
Per hectare	29,629	-----	27,882	-----

TABLE XIV.—Yield in cubic meters on *Hagachac I* type (685 hectares).

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches).	
	Average yield per hectare.	Total yield.	Average yield per hectare.	Total yield.
<i>Hagachac</i>	43.28	29,646.80	40.36	27,646.60
<i>Lauan</i>	42.42	29,057.70	39.94	27,358.90
<i>Guijo</i>	13.71	9,391.85	12.87	8,815.95
<i>Amuguis</i>	7.89	5,404.65	7.06	4,836.10
<i>Malagabi</i>				
<i>Sacat</i>	1.89	1,294.65	1.48	1,018.80
<i>Calumpit</i>				
<i>Narra</i>	1.85	924.75	1.31	897.35
<i>Apitong</i>.....	.24	164.40	.24	164.40
Total	110.78	75,884.80	108.26	70,733.10
Per acre	44.88	-----	41.79	-----

TABLE XV.—*Yield in board feet on Hagahac II type (2,000 acres).*

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches).	
	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
Hagahac -----	4,078	8,156,000	8,942	7,884,000
Lauan -----	2,410	4,820,000	2,234	4,468,000
Amuguis -----	1,828	2,656,000	1,287	2,474,000
Guijo -----	388	666,000	310	620,000
Malagabi -----	256	512,000	256	512,000
Sacat -----				
Calumpit -----				
Total -----		8,406	7,979	15,958,000
Per hectare -----	20,768	-----	19,716	-----

TABLE XVI.—*Yield in cubic meters on Hagahac II type (810 hectares).*

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches).	
	Average yield per hectare.	Total yield.	Average yield per hectare.	Total yield.
Hagahac -----	36.46	29,582.60	34.92	28,285.20
Lauan -----	22.90	18,549.00	21.35	17,293.50
Amuguis -----	12.60	10,206.00	11.70	9,477.00
Guijo -----	3.26	2,640.60	3.01	2,488.10
Malagabi -----	2.37	1,919.70	2.38	1,919.70
Sacat -----				
Calumpit -----				
Total -----	77.59	62,847.90	73.85	59,413.50
Per acre -----	31.40	-----	29.68	-----

TABLE XVII.—*Yield in board feet on mixed type (4,200 acres).*

Species.	Cutting to a diameter limit of 40 centime- ters (16 inches).		Cutting to a diameter limit of 50 centime- ters (20 inches).	
	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
Lauan -----	2,466	10,857,200	2,851	9,874,200
Guijo -----	1,267	5,321,400	1,201	5,044,200
Amuguis -----	721	3,028,200	655	2,751,000
Malagabi -----	280	1,176,000	257	1,079,400
Sacat -----				
Calumpit -----				
Total -----	4,734	19,882,800	4,464	18,748,800
Per hectare -----	11,697	-----	11,020	-----

TABLE XVIII.—*Yield in cubic meters on mixed type (1,700 hectares).*

Species.	Cutting to a diameter limit of 40 centimeters (16 inches).		Cutting to a diameter limit of 50 centimeters (20 inches).	
	Average yield per hectare.	Total yield.	Average yield per hectare.	Total yield.
Lauan	23.84	40,528	22.54	38,318
Guijo	11.88	20,196	11.18	18,921
Amuguis	6.92	11,764	6.27	10,659
Malagabi				
Sacat	2.67	4,539	2.34	3,978
Calumpit				
Total	45.31	77,027	42.28	71,876
Per acre	18.83	—	17.11	—

TABLE XIX.—*Total yield in board feet on Narra, Hagachac, and mixed types (11,339 acres).*

[Cutting to a diameter limit of 40 centimeters (16 inches).]

Species.	Narra type.	Hagachac I type.	Hagachac II type.	Mixed type.	Total yield.	Per cent.
Narra	4,305,303	228,420	—	—	4,533,723	4.48
Hagachac	982,395	8,146,980	8,156,000	—	17,285,375	17.07
Lauan	28,629,185	7,657,992	4,820,000	10,857,200	46,464,377	45.90
Amuguis	4,348,220	1,350,216	2,656,000	3,028,200	11,877,686	11.24
Guijo	5,453,154	2,632,924	666,000	5,321,400	18,978,478	18.80
Apitong	4,136,400	37,224	—	—	4,173,624	4.12
Malagabi						
Sacat	1,406,376	385,016	512,000	1,176,000	3,429,392	3.39
Calumpit						
Total	44,256,033	20,288,772	16,810,000	19,882,800	101,237,605	100

TABLE XX.—*Total yield in board feet on Narra, Hagachac, and mixed types (11,339 acres).*

[Cutting to a diameter limit of 50 centimeters (20 inches).]

Species.	Narra type.	Hagachac I type.	Hagachac II type.	Mixed type.	Total yield.	Per cent.
Narra	4,219,128	221,652	—	—	4,440,780	4.64
Hagachac	987,584	7,686,756	7,884,000	—	16,508,340	17.2
Lauan	22,515,804	7,272,216	4,468,000	9,874,200	44,180,220	46
Guijo	4,998,150	2,404,332	620,000	5,044,200	18,066,682	18.64
Amuguis	4,096,086	1,203,012	2,474,000	2,751,000	10,523,048	11
Apitong	3,964,050	37,224	—	—	4,001,274	4.2
Malagabi						
Sacat	1,827,095	267,336	512,000	1,079,400	3,185,881	3.34
Calumpit						
Total	42,056,847	19,092,528	15,958,000	18,748,800	95,856,175	100

PLATE X.
Hagahac; diameter, 107 centimeters.





DESCRIPTION OF TREE SPECIES.

NARRA.
(*Pterocarpus indicus*.)

This tree occurs throughout the forest on the lowlands back of the large mangrove swamp near Daihagan Point. It is a tree of the newly made flats and is seldom found in the higher and older forest farther back. It is known on the market as Yellow Narra.

Narra is a low-branching, spreading tree, usually producing a bole with a merchantable length of from 8 to 10 meters, or about 30 feet. (Pl. VIII.) The bole is angular and irregular in cross section. The average diameter of trees over 40 centimeters (16 inches) is 73.86 centimeters (27.07 inches). Many of the logs of Narra, especially of the old trees, are defective at the center. Narra has wide, flat buttresses, from which table tops from 5 to 6 feet in diameter are often taken. (Pl. IX.) It demands considerable light and is never found in dense clumps. Reproduction is poor, excepting in a few open places. It sprouts freely from the stumps, and logs lying upon the ground send out both roots and shoots. It could probably be propagated from cuttings planted in the wet season.

Narra is, without question, the most valuable timber found on the tract. The wood of Narra is moderately heavy, moderately hard, very durable, and is seldom, if ever, attacked by the white ant. It is especially valuable for cabinet work, and is also a valuable construction timber.

HAGACHAC.
(*Dipterocarpus lasiopodus*.)

Hagachac is found on the higher, better-drained portions in the older forests, upon the flats, and the low foothills. Growing more or less in clumps, it is usually the predominant species in places where it is found.

Hagachac produces a tall, even bole (Pl. X), almost round in cross section. A tree of average height, with a stump diameter of 70 centimeters (28 inches), which was felled and measured, had a clear length of 30 meters to the first branch, at which place its diameter was 38 centimeters. Often higher trees than this are found. An average diameter of 66.31 centimeters (26.1 inches) was found for trees over 40 centimeters (16 inches) in diameter. The tree has few exterior defects, and is usually sound throughout. It is not usually strongly buttressed, although on old trees there is a large root swell. Hagachac seeds plentifully and reproduces as well or better in shady places than any other timber tree. The young saplings and poles grow rapidly and soon shoot up above the surrounding vegetation, where they receive an abundance of light. Hagachac has been but little cut and is sold under the name of Apitong.

LAUAN.
(*Shorea contorta.*)

This is the most widely distributed tree in the forest. It is found in limited numbers in every type of lowland forest, except the swamps, and is also present in the foothills.

Lauan has a tall and regular bole, reaching a height nearly equal to that of Hagachac. (Pl. XI.) The average diameter of Lauan trees over 40 centimeters (16 inches) in diameter upon the Hagachac type is 64.88 centimeters (24.42 inches) and upon the Narra type 67.28 centimeters (26.48 inches). The young trees of Lauan are little buttressed, but old trees often have very large ones.

Lauan is tolerant, reproducing in places where there is only a small amount of light. (Pl. XII.) Mature trees stand above the surrounding vegetation, and when very large are sometimes hollow or defective at the heart. Lauan is used in construction and inside work, but does not stand well in contact with the soil, and is often eaten by the white ant.

GUIJO.
(*Shorea guiso.*)

This tree (Pl. XIII) occurs over all of the low flat country and on lower hillsides, usually as scattered individuals. It is a tall-growing tree, having a clear-length of 20 to 26 meters (65 to 85 feet). It reaches a diameter of 120 centimeters (47 inches). The average diameter of Guijo trees over 40 centimeters (16 inches) in diameter upon the Hagachac type is 66.4 centimeters (26.26 inches) and on the Narra type 61.99 centimeters (24.4 inches). The tree has small or medium-sized buttresses, though many have no more than a large root swell. In favorable places reproduction is good. The wood of Guijo is moderately heavy and hard, strong, brittle, fairly durable, and usually free from defects. It is a good general-construction timber.

AMUGUIS.
(*Koordersiodendron pinnatum.*)

In almost all of the moist flats and hillsides Amuguis grows as scattered trees throughout the forest.

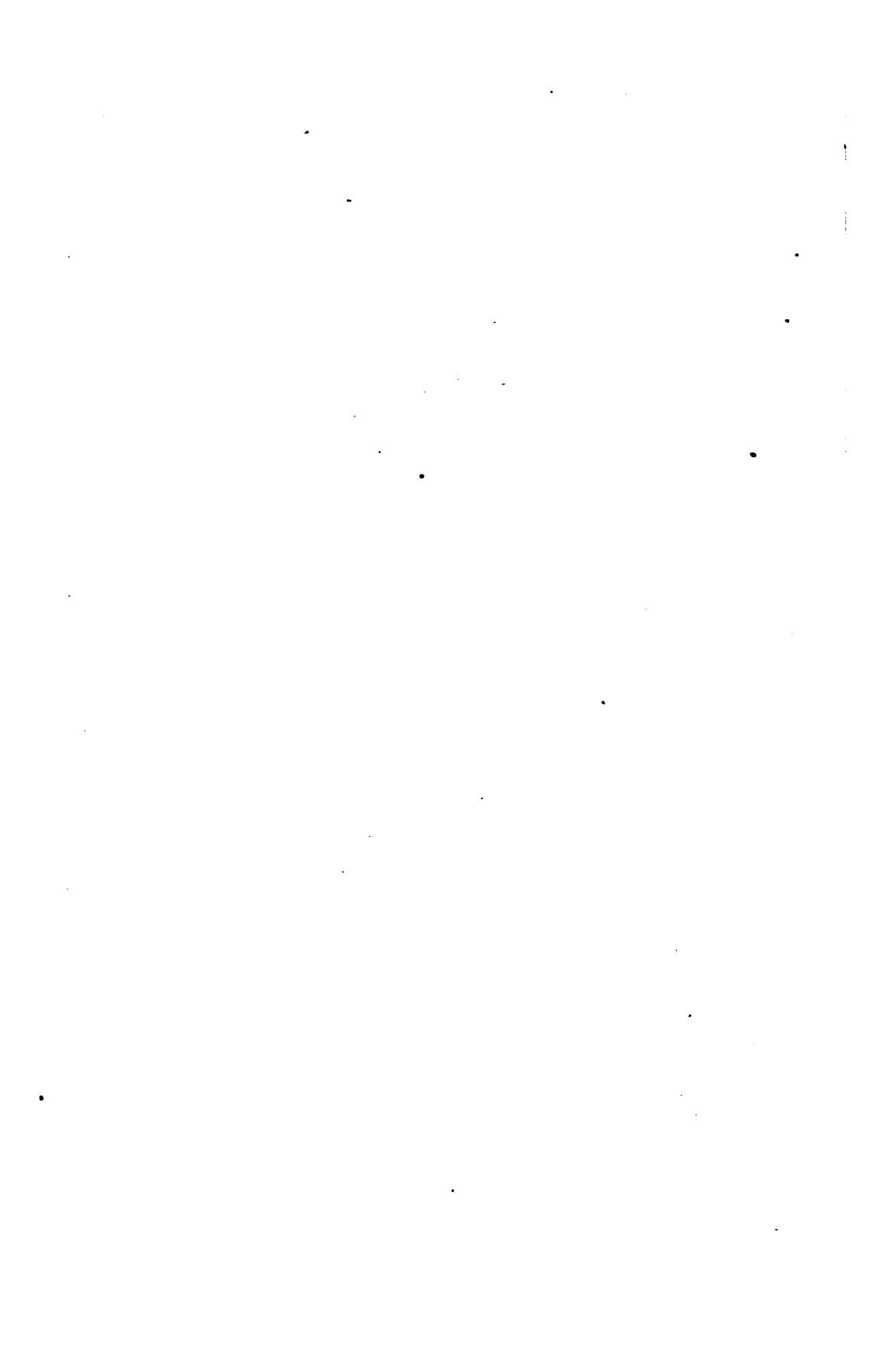
Although not so tall growing as Lauan, Guijo, or Hagachac, it usually reaches above most of the surrounding trees, having a clear length of from 12 to 15 meters (39 to 49 feet). The bole is evenly tapered and nearly round in cross section. The average diameter on the Narra type for trees over 40 centimeters (16 inches) is 64.03 centimeters (25.2 inches) and on the Hagachac type 58.2 centimeters (25.16 inches).

While not so tolerant as many of its associates, it nevertheless will grow and reproduce in partially shaded places. Reproduction is usually good. Broken branches are not uncommon, and hollows in the trunks of larger trees are frequently found. Amuguis is a structural wood of medium quality that is fairly strong, brittle, moderately heavy,



PLATE XI.

A young tree of Lauan; diameter, 30 centimeters.



and hard. It is used in ordinary construction and in cabinet work. When used for rails on the logging tramway, it gave excellent satisfaction, proving to be the best of any timber tried.

APITONG.
(*Dipterocarpus* sp.)

This tree is found only in the lower half of the Narra type. Apitong has a tall, regular bole (Pl. XIV) and reaches a height of 30 meters (98 feet), with an average diameter for trees over 40 centimeters (16 inches) of 67.8 centimeters (26.69 inches). The tree is quite tolerant when young, and in favorable places has a good reproduction. It is known locally as Apitong, by which name it is sold upon the market. It very closely resembles the true Apitong (*D. grandiflorus*) and apparently is as good for construction purposes.

SACAT, CALUMPIT, AND MALAGABI.
(*Terminalia* spp.)

The tree species Sacat (*Terminalia nitens*), Calumpit (*T. edulis*), and Malagabi (*T. pellucida*) are two widely scattered to be of any great importance commercially, although they are found over almost all parts of the tract. They are tall growing and usually of large diameter. The average diameter of *Terminalia* trees over 40 centimeters (16 inches) upon the Narra type was 66.44 centimeters (26.15 inches). Reproduction is not plentiful and the trees are evidently quite intolerant of shade.

DAO.
(*Dracontomelum mangiferum*.)

Widely distributed over the whole tract, Dao is the predominant tree in some of the poorer grades of forest and a common one in nearly all. It reaches a height of from 12 to 20 meters (39 to 65 feet) to the lowest branches and a diameter of as much as 150 centimeters (59 inches). The average diameter of trees over 40 centimeters (16 inches) on the Hagachac type is 75 centimeters (30 inches); in the Narra forest, 77.94 centimeters (30.68 inches). It has the largest buttresses of any common tree in the forest. Reproduction is not plentiful, for the tree is intolerant. Although never used, the wood appears to be of good quality. This is the most promising tree which has not been commonly used for lumber purposes.

MALAGUIBUYO.
(*Celtis* sp.)

A commonly distributed tree, having an average diameter on the Hagachac type for trees over 40 centimeters (16 inches) of 55.23 centimeters (21.74 inches) and reaching a height of 10 meters (33 feet), this tree may possibly prove to be of value, although it has never yet been used.

AGUPANGA.
(*Chisocheton* sp.)

This tree is one of the most widely scattered of any and seeds and reproduces rapidly. Comparatively low growing, with a spreading top, it nevertheless is quite tolerant of shade. It seldom reaches a large size and probably will never make a valuable commercial wood.

INJURIES TO WHICH THE FOREST IS LIABLE.

Of all the injuries to which the forest is subjected, by far the largest part comes either directly or indirectly as the influence of man. Chief among these are caiñgins and grass-land fires. Forest fires, in the usual acceptance of the term, are unknown.

CAIÑGINS.

As already mentioned under the description of the Calaan type, it has long been the custom with the natives to enter the forest and to fell all of the trees upon a certain area at the commencement of the dry season. This area is burned over at the end of the dry season and planted to crops. Such a clearing is called a "caiñgin."

In times past the damage done by these caiñgins has been very great. A consultation of the map will serve to illustrate this. The Calaan area has been formed in this way from what was probably at one time good forest. The stand and yield tables show the same things. With the exception of the Narra type, which has largely escaped because it is less accessible and lacks an equally good running water supply, the yield of timber has been greatly reduced by the numerous caiñgins made. The loss is much greater near to and upon the foothills of the mountains, where the primitive Mangyans have for a long time worked unrestricted. While the damages has in recent years been largely checked, it still continues.

Under present conditions the demand for caiñgins will probably continue, for they are regarded by the people as a necessary as well as a natural right. This demand may be met by allowing caiñgins to be made upon the Calaan, and, in exceptional cases, upon the Guipa type. A careful patrol of the tract during the first part of the dry season for the purposes of granting caiñgin permits and to punish those making unauthorized caiñgins will, it is believed, greatly lessen and eventually check this evil.

GRASS-LAND FIRES.

Practically all of the grass land upon the tract is burned over every spring and summer. In many places this effectually keeps out all the trees and in others does serious injury to the few that are present. In the river bottoms, which are annually flooded by the excessive rains, and upon the pastured grass land near the villages, fires are not so

PLATE XII.
Reproduction of Lauan. This bed of seedlings is in a shade density of about 0.75.





important, since this land will probably continue to remain grass land in any event, but, in other places unaffected by floods, fires have done a great deal of damage. With the present force, and under the present conditions, it will be impracticable to entirely prevent these fires.

NATURAL CAUSES.

A few trees, especially those growing in the more open places, lose branches or tops from wind, but, as a rule, the damage done from this source is unimportant.

Insects and fungi are destructive mainly to felled timber, and often logs of the poorer kind that are left in the woods for any time are quite seriously attacked by insects or fungi, or by both. To avoid this damage, as well as to prevent the injury of the young growth which might spring up while they were left, these logs should be removed to some dry, open place as soon after cutting as possible.

THE UTILIZATION OF THE FOREST.

TIMBER.

HISTORY OF LUMBERING.

The license agreement of the Mindoro Lumber and Logging Company is dated June 3, 1905. Table XXI, computed from data taken from the company's books, shows the amount of timber that has been marketed from that time to July 1, 1906.

TABLE XXI.—*Timber sold by the Mindoro Lumber and Logging Company during the year ended June 30, 1906.*

Name.	In the log (round).		Name.	In the log (round).	
	English cubic feet.	Cubic meters.		English cubic feet.	Cubic meters.
Guijo	20,284.04	574.35	Pahutan	189.19	5.86
Narra	8,648.67	244.89	Pili	44.59	1.26
Lauan	5,822.66	164.88	Malugay	52.54	1.49
Apitong	2,612.65	73.97	Ipi	40.20	1.14
Amuguis	1,279.79	36.24	Others	328.68	9.81
Candol-candol	651.87	18.45	Total	40,560.56	1,148.50
Palo Maria	429.48	12.16			
Pagsahifing	176.70	5			

Timber sawn on tract by company's sawmill.

	Feet B. M.
Lauan	24,219
Amuguis	10,535
Apitong	5,611
Guijo	5,503
Narra	2,112
Total	47,980

In addition to this, a small amount of timber is still at the mill which, with the amount that has been used for construction purposes on the tract, is approximately equal to the quantity of sawn timber sold.

Previous to July 3, 1905, a number of individuals or companies have from time to time held this tract, or portions of it, together with some adjacent forest. In no case did these concessions coincide with the present one, hence it is impossible to state the exact amount removed from it. It is believed, however, that only a small amount of timber had been cut from the forest south of the Bongabon River. North of the Bongabon River a larger number of logs have been taken from the scattered timber lands near the Tidiangan and Sucol Rivers. It is stated by the natives that in former times a great many logs had been sold from the barrio of Paclasan from territory now occupied by Calaan and grass.

PRESENT LUMBERING OPERATIONS.

A very primitive method of logging, similar to that employed by native lumbermen, has been used by the present company. The trees are felled and chopped by Filipino laborers into lengths 3 to 6 meters (10 to 20 feet) long. For this work American axes are used, although occasionally saws are substituted. The logs are then loaded upon rude sleds similar to the logging "dray" of the United States, and dragged by a team of from six to eight carabaos to the mill or to some point along the tramway which leads to the beach. The rough trails over which this hauling was done are made by merely cutting away the underbrush. These roads are passable, except at the lowest places, at almost any season of the year. At the tramway the logs are loaded upon small cars drawn by one or two carabaos and hauled one at a time to the beach.

The cost of such operations as this can only be given approximately. Ordinary wages and costs are about as follows:

Manager	per month....	₱150.00
Head foreman	do.....	40.00- 60.00
Gang foreman	per day....	1.00
Choppers	do.....	.75- 1.00
Others laborers	do.....	.50- .75
Carabao, with driver	do.....	1.50- 1.75
Carabao, value	each....	100.00-150.00

₱2=\$1 U. S. currency.

Two men can fell and cut into logs from two to four medium-sized trees per day, or from 300 to 500 English cubic feet. A team of six to eight carabaos, with a driver for each animal, will haul from three to six logs per day for an average distance of half a mile. Two carabaos and their drivers will haul about four logs per day on the tram car from the mill to the beach, a distance of $1\frac{1}{2}$ miles.

Working upon this rude basis, the cost of cutting and delivering at

the beach by the present method will vary from ₱0.07 to ₱0.13 per English cubic foot, depending greatly upon the length of haul, management, and kind of timber cut. Counting an English cubic foot equivalent to 7.2 feet B. M.,² this would be a cost of from ₱9.75 to ₱18 per 1,000 board feet. Contracts are sometimes made to cut and deliver logs to the beach when the average distance is one-half mile, at the rate of ₱2 per average log of 40 or 50 cubic feet, the contractor being supplied with carabaos by the owner. This would mean about ₱6 per M feet B. M., in addition to the rental of the carabaos. In other cases, the contractor supplies his own carabaos and received from ₱0.08 to ₱0.10 per English cubic foot, or about ₱12 per M feet B. M. for logs delivered on the beach.

The present cost of logging could be greatly reduced by more careful organization and by providing cheaper methods of transporting the logs from the forest to the beach, which is by far the largest single item of expense. To do this, it is suggested that iron rails be used upon the tramway, instead of wooden ones. This would permit the hauling of several logs instead of one at a time, would avoid breakage of rails and cars, and would greatly reduce the draft, thus permitting more trips per day. It is also suggested that wide-tired, two-wheeled logging carts be tried instead of the logging sled. These have a lighter draft, and, where tried in other parts of the Islands, have given excellent satisfaction. A steam logging and skidding outfit, including two donkey engines and 2 miles of cable, could be used upon the tract and would greatly reduce the cost of logging.

A portable sawmill, having a capacity of about 10,000 feet B. M. per day, has been placed upon the tract. Owing to difficulties incident to the installation of this mill, it has not yet been operated sufficiently to allow any estimate of the cost of running.

In addition to the regular logging operations, the present company has cut a number of table tops from the large flat buttresses of Narra trees. These can be removed with saws and axes and can be secured up to 6 feet in diameter. Usually the buttresses vary from 4 to 12 inches in thickness, and may be hewed to an even thickness of about 3 inches. One of these tops, which measured 6 feet in diameter and 3 inches in thickness, was removed under the direction of the field party at a cost of a little less than ₱18.00. In this case, the men were hired for this work alone. With a regular organized force, the cost should be reduced about one-half.

² Measurements made by the Gibson's Saw and Planing Mills Company upon a few Narra logs that were sawn with a band saw showed the following facts: Forty-three logs, containing 41.81 cubic meters (1,476.58 English cubic feet), yielded 15,199 feet B. M. of lumber not edged. Allowing for a waste in edging of 20 per cent, this would be a yield of 290.81 feet B. M. per cubic meter, or 8.24 feet B. M. per cubic foot. The above factor of 7.2 feet B. M. per cubic foot is therefore conservative.

MARKETS AND TRANSPORTATION.

Practically all of the logs and lumber is sent to Manila by means of steamers or sailboats. The cost of shipment from the tract to Manila (distance 200 miles) varies from ₱0.18 to ₱0.25 per English cubic foot, which would be, counting an English cubic foot equal to 7.2 feet B. M., ₱25 to ₱34.72 per M feet B. M. The cost of transportation is slightly less upon sailing vessels than upon steamers. The logs are floated to the ships, which, on account of the shallow water, are required to anchor nearly one-quarter of a mile from shore. The regular charge for this is ₱0.50 per log, which amounts to about ₱0.01 per English cubic foot, or ₱1.39 per M feet B. M. Weather conditions are an important factor to be considered in connection with transportation. Sometimes storms delay loading, hinder transit, or affect the shipper very seriously in a number of ways.

The following are the average prices now paid in Manila for logs and for sawn timber:

Name.	Per English cubic foot in the log.	Per Spanish cubic foot in the log.	Per M feet B. M., sawn timber.	Stumpage charges per M feet B. M. (United States cur- rency).
Yellow Narra	₱0.92-₱1.05	₱0.70-₱0.80	₱225-₱275	\$5.00
Hagachac	.46-.48	.85-.87	90-115	1.00
Lauan	.39-.46	.30-.35	70-90	1.00
Amuguis	.52-.58	.40-.75	110-150	2.00
Gujo	.65-.85	.60-.65	98-140	3.00
Apitong	.46-.48	.85-.87	90-115	2.00
Seacat	.52-.58	.40-.75	100-150	2.00

FINANCIAL RESULTS AND PROSPECTS.

Summarized, the cost, exclusive of taxes or stumpage charges of logging and delivery in Manila, should not exceed the following:

	Per English cubic foot.
Cutting and delivering on the beach	₱0.07 to ₱0.13
Loading upon shipboard .....	.01 to .01
Shipping to Manila.....	.18 to .25
Wages of officials, breakage, etc.....	.02 to .02
Total .....	.28 to .41

This cost, as with the calculations throughout, is estimated regardless of the groups to which the logs belong. As a matter of fact, it costs slightly more to remove Narra than other kinds of timber, for the trees are lower growing and the logs harder to handle on account of their angular shape. With the other kinds of timber there is but little difference in the cost of handling.

Taking into account the stumpage charges, the cost of delivery, and the selling prices, it will be seen that there is an excellent profit to be

¹ These figures, obtained from shippers, are thought to be high.



PLATE XIII.

A young tree of Guijo; diameter, 34 centimeters.



made upon the higher-group timbers, and a fair one upon all, even with the primitive methods in use. With improved methods and equipment, the cost should be so reduced that an assured profit could be made upon all timber taken from the forest.

MINOR PRODUCTS.

FIREWOOD.

Almost all the trees which compose the thick mangrove swamps of the coast make an excellent firewood. Firewood is commonly cut into two general sizes. The small sizes, called "leñas," are less than 2 feet in length and 3 inches in thickness. The other size, known as "rajas," are about 5 feet in length and not over 6 inches in thickness. It costs from ₱6 to ₱9 to gather 1,000 rajas, while the Manila price varies from ₱20 to ₱50. The market prices and cost of gathering leñas is correspondingly less. The forest tax on rajas is ₱1 per 1,000 feet and on leñas ₱0.10 per cubic meter. As yet but little firewood has been cut from this tract, although the supply is very large.

TAN BARKS AND DYE BARKS.

The bark of a number of the mangrove swamp trees is valuable both for tanning and dyeing. As previously stated, the general terms of Bacauan (Bacao) and Tañgal are applied to many species of the *Rhizophoraceæ*. Another species, Tabigue, produces a good quality of dye bark and is very common. Tan bark and dye bark are generally sold in bundles composed of pieces 3 feet long and 3 or 4 inches wide, weighing 1 picul (139.4 English pounds). The Manila price is about ₱2 per picul, while the local selling price is about ₱0.75 per picul.

BEJUCOS.

Large quantities of bejuco, or rattan, are found in the forest. These vary considerably in value, the smaller ones being usually the best. These are usually cut into lengths 6 meters long and tied into bundles of from 50 to 100 pieces each. One man with a bolo can cut and prepare in one day about 6 bundles of 50 pieces each.

OTHER MINOR PRODUCTS.

The leaves of the Nipa palm are very commonly used locally for roofing and thatching, but as yet little has been marketed.

The young leaves of the Buri palm are gathered just before they open, spread out in the sun, and allowed to wilt for about two days. They are then made into rolls, each about 1 foot in diameter and 2 inches thick, and used for making baskets, hats, mats, etc. The market for this product is as yet but little developed. The local selling price is ₱2.50 for 100 rolls.

The sap of the Pili and Pagsahiñgin is gathered after slashing the trees with a bolo and leaving the resin until it hardens. It is then made into torches of convenient size, by wrapping in Anahao leaves. These are commonly used by the natives for lights and sold locally for ₱0.02 each. The resin of Pili has the market name of Manila Elemi, and is a commercial product from some portions of the Islands.

A number of vines, classed under the general name of Gogo, are gathered in pieces about 1 meter long, and sold locally for ₱3.50 per 100 pieces. These are pounded into a pulp and used as a soap for washing the hair. The principal species which produces this product is *Entada scandens* Benth.

A number of vines under the general name of Diliman are gathered and used in tying fish traps and other similar articles. The fruit of the Bongan gubat palm (a wild betel nut) is chewed by the natives very generally. The heart of the Yroc palm is commonly used for food and has a taste very much like fresh cabbage. A flour called "Yuro" is also made from this palm. The leaves of the Yroc palm make excellent brooms and are much used locally. Many other less important minor products are secured by the natives and are locally of value.

AGRICULTURAL POSSIBILITIES.

The soil over the larger part of the tract is well adapted to agricultural purposes. Table XXII contains a summary of the analyses of twenty-three soil samples taken from twelve widely separated places on the flat portion of the tract:

TABLE XXII.—*Chemical analysis of soil.*^a

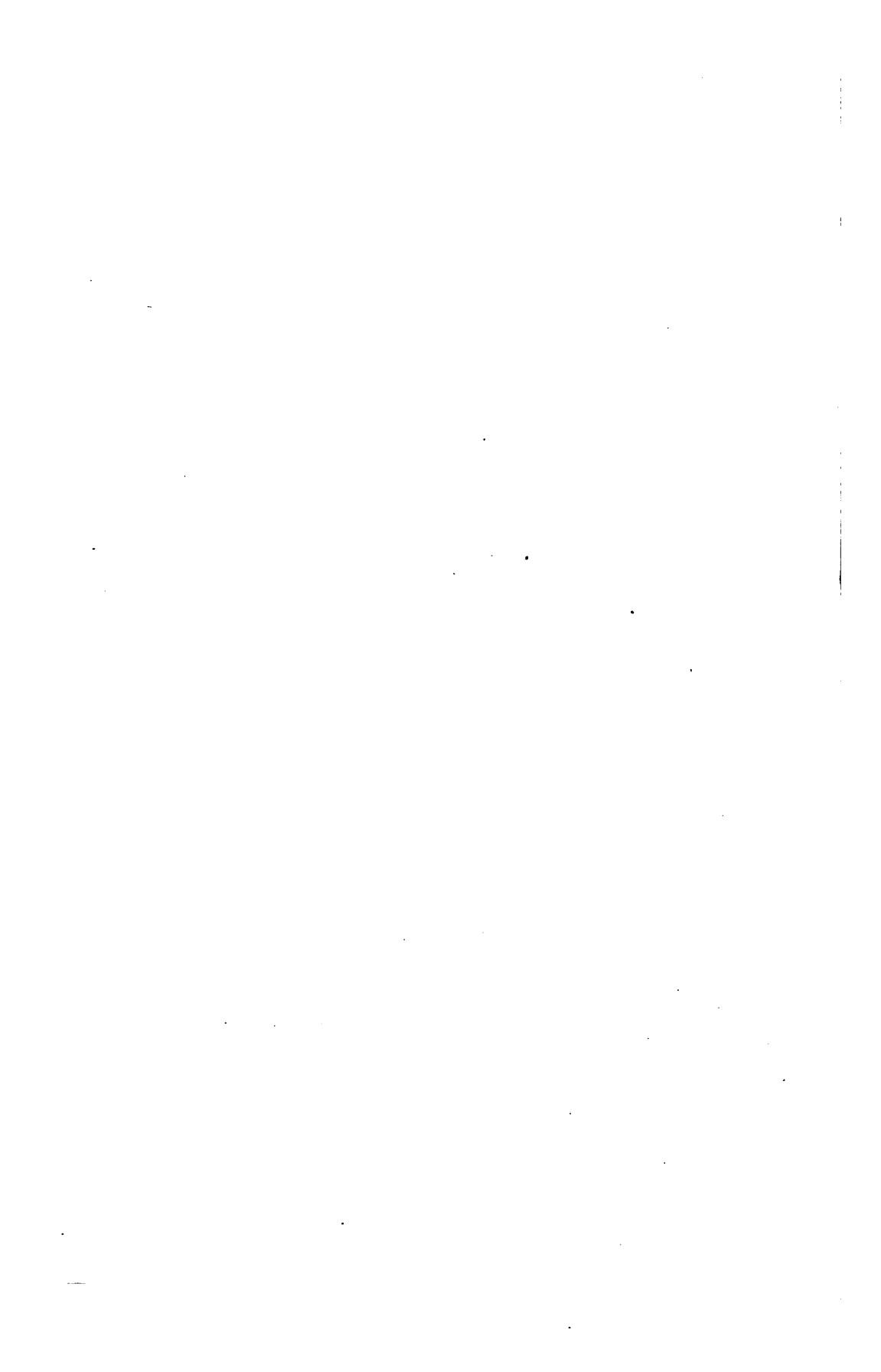
Sample.	Number of samples taken.	Loss on ignition.	CaO.	P ₂ O.	N.	K ₂ O.	Na ₂ O.	Fine earth through 40 mesh.
Surface to 20 centimeters (8 inches)-----	9	8.08	0.50	0.10	0.25	0.53	0.16	94.9
Subsoil from 20 to 120 centimeters (8 to 47 inches)-----	9	3.79	.48	.06	.06	.33	.25	95.9
Subsoil below 120 centimeters (47 inches)-----	5	8.78	1.01	.03	.03	.26	.21	91.1

^a By L. A. Salinger, chemist, Bureau of Science, Manila, P. I.

While too much reliance should not be placed upon any chemical analysis of soils as an indication of their fertility, it is to be noted that the amount of nitrogen (N), phosphoric acid (P₂O), and potash (K₂O) found here is sufficient, under ordinary conditions, to supply the needs of plant growth, and compares favorably with analyses from other places. The vegetation, both cultivated and wild, is everywhere rank and dense, indicating that a sufficient quantity of this plant food is in an available form.



PLATE XIV.
Apitong ; diameter, 126 centimeters.



With few minor exceptions, the soil over the whole tract resembles quite closely that of the samples taken. Usually, the surface soil is from 5 to 25 centimeters (2 to 10 inches) in depth and contains a considerable amount of humus. A clay or sandy clay subsoil reaches to a depth of from 75 to 200 centimeters (28 to 78 inches). Below this no investigations were made.

Of equal importance is the question of rainfall and drainage. As already stated, the rainfall in this place is well distributed throughout the year. At no time during the dry season, while field work for this report was being done, was the soil dry except at the surface in exposed situations or in pure sand or gravel. There is in most places a sufficient quantity of sand mixed with the clay to allow for drainage.

Probably the most suitable crop is Manila hemp or abaca. Considerable quantities of this have already been planted. In the foothills, cacao is raised by the Mangyanes with success. Cocoanuts, rice, sugar cane, tobacco, corn, and various vegetables are the other principal crops.



PART II.

FUTURE MANAGEMENT.

BASIS OF PROPOSALS.

RELATION BETWEEN OWNER AND LICENSEE.

The public forest on this tract is owned by the Philippine Government and is in the charge of the Bureau of Forestry. It is held by the Mindoro Lumber and Logging Company under a twenty-year license agreement. This agreement grants them the exclusive right to cut, collect, and remove timber, firewood, and bejuco on the condition that they make use of their license privilege, pay the regular Government charges on the products taken, and follow the Bureau of Forestry rules and regulations for gathering them.

It is important to the licensee, as well as to the Bureau of Forestry, that provision be made for a future yield from the tract.

SUMMARY OF STAND AND YIELD.

A review of Tables VI, VII, VIII, and IX shows that the heaviest stands are upon the Narra tract, with that upon the Hagachac type next. Of the timber trees, Lauan stands first, 46 per cent of the total yield; Hagachac second, 17 per cent; Guijo third, 13 per cent; Amuguis fourth, 11 per cent; Narra and Apitong, about $4\frac{1}{2}$ per cent each, and *Terminalia* sp. less than 4 per cent.

It is thus noted that while the cheaper timber predominates, the total quantity of Guijo, Amuguis, and Narra constitute 28 per cent of the whole.

Altogether, the total yield of timber trees over 50 centimeters (20 inches) in diameter from the 11,339 acres estimated, is 95,856,175 feet B. M. If the sawmill were run at its full capacity of 10,000 feet B. M. per day, this amount, which includes only the seven species now being cut, is sufficient to last thirty-two years of 300 working days each. In addition to these kinds, there are a great many large trees of other species, some of accepted commercial value, which would no doubt be utilized by any permanently located lumber company. By the time the present stand is removed the poles and trees under 50 centimeters (20 inches) would in all probability supply a second crop.

METHOD OF TREATMENT.**OBJECT TO BE ATTAINED.**

The object in view for the commercial forest area is (1) to regulate the cutting of timber in such a manner that the mature trees, together with such others as is consistent with good management, may be removed from the forest as soon as possible, and (2) to retain in the forest the young stock, and, if necessary, seed trees, and to assist natural reproduction so that future crops can be provided for.

The object in view for the non-commercial forest is (1) to supply the demand for agricultural lands, either as caiñgins or in some other form, and (2) to convert as much as possible of the Guipa type into commercial forests.

METHOD OF TREATMENT ADOPTED.

Owing to the lack of definite knowledge of the age of trees and of their rapidly and habits of growth, and to the conditions under which this plan must be put into operation, the selection system of felling is the one which will be used for the commercial forest. The fellings should be so regulated as to remove all old and over-mature trees, to protect the young growth, and to aid in every possible way natural regeneration.

EXPLOITABLE SIZE.

Since there are a large number of mature and over-mature trees in the commercial forest which should be cut as soon as possible, the exploitable size of the trees has been fixed at 50 centimeters (20 inches) in diameter. Trees below that diameter should only be cut when marked by the forester in charge, and then only when the mature trees have been removed or when an especially heavy stand will admit of thinning.

Table XXIII, compiled from the stand tables previously given, shows the number of trees over 50 centimeters (20 inches) in diameter, compared with the number from 10 centimeters (4 inches) to 50 centimeters (20 inches) in diameter.

TABLE XXIII.—*Summary of stand of principal trees per acre.***NARRA TYPE.**

Species.	Diameter.		Total.
	10-50 centimeters (4-20 inches).	Over 50 centimeters (20 inches).	
Narra	1.153	1.808	2.956
Lauan	8.587	4.698	13.285
Guijo	8.035	1.190	4.225
Hagachac	.411	.126	.587
Amuguis	1.994	1.619	3.613
Apitong	2.008	.886	2.844
Malagabi			
Sacat			
Calumpit			
Total	17.635	10.708	28.343

TABLE XXIII.—*Summary of stand of principal trees per acre—Continued.*

HAGACHAC TYPE.

Species.	Diameter.		Total.
	10-50 centimeters (4-20 inches).	Over 50 centimeters (20 inches).	
Narra	0.087	0.201	0.288
Lauan	4.719	8.588	8.257
Guijo	1.725	1.064	2.789
Hagachac	6.159	8.106	9.265
Amuguis	1.726	1.122	2.848
Apitong	.143	.057	.200
Malagabi	}	.546	.776
Sacat			
Calumpit			
Total	15.105	9.318	24.428

LOGGING.

CUTTING AREAS.

Cutting areas should conform as nearly as possible to the wishes of the licensee. When, however, cuttings shall have been started from any one base and over an area approved by the forester in charge, it shall not be carried on outside of that area without the consent of the forester in charge or of the Director of Forestry.

For the present, logging operations should be continued from the present base until the north end of the Narra and adjacent parts of the Hagachac types shall have been cut over. Operations should then be started from the Dungay River as a base and a tramway extended back through the south end of the Narra type and the narrow strip of Hagachac adjoining it. The work upon this being completed, the remainder of the Narra and of the Hagachac I forests should be logged. Next, the tract designated on the map as Hagachac II should be cut, and, last of all, the mixed forest. In every case, cutting on one part should be finished before it is commenced on the next. Thus a very primitive rotation is established, and, by the time the last area is cut over, the large poles and younger trees left upon the first part worked should be ready for a second crop.

CUTTING RULES.

(1) Felling of trees shall be permitted only over such areas as are approved by the forester in charge or by the Director of Forestry. In assigning cutting areas, the forester shall follow as nearly as possible the plan suggested in the paragraph headed "Cutting areas."

(2) No Narra trees shall be felled except those marked by the district forester.

(3) No timber trees shall be felled which are less than 50 centimeters (20 inches) in diameter at breast height or, in cases of trees having

buttresses, at the lowest place above the buttress swell, unless marked by the district forester.

(4) In cutting marked timber, the marks upon the stumps shall not be destroyed or effaced.

(5) Trees shall not be cut higher above ground than the diameter of the tree, except in cases of trees having buttresses which may be cut above the highest buttress.

(6) Buttresses shall not be cut for table tops or for any other purpose from any living tree.

(7) All merchantable timber shall be removed from the forest within two months from time of felling, and placed upon some suitable skidway or landing.

(8) The licensee shall be held responsible for the destruction of, or serious injury to, young timber trees by careless felling, and for all merchantable timber left in the woods.

(9) No Narra, Lauan, Amuguis, Guijo, Hagachac, Apitong, or other trees of equal value shall be used for the construction of roads or skidways.

(10) Minor species may be cut and used for the construction of roads, skidways, etc., without charge.

(11) None of these special rules shall be construed to excuse the licensee from the regular Bureau of Forestry rules and regulations or from the terms of the license agreement.

SUPPLEMENTARY RECOMMENDATIONS.

GENERAL MANAGEMENT.

All timber trees marked by the district forester shall be stamped in at least two places with the regulation marking hatchet, in addition to such other distinctive marks as he may see fit to use. These marks shall be placed below where the tree is to be cut in felling.

If a reasonable advantage is not taken of the privilege to gather firewood and bejucos by June 30, 1907, the exclusive right to remove these products should be taken from the company and licenses to gather said products granted to such other party or parties as may apply for them.

PROTECTION.

Since the proper protection of the forest depends so much upon the attitude of the local inhabitants, every legitimate effort should be made by the forest officers to gain their confidence and corporation.

A forest officer should go over the entire tract at the beginning of the dry season and see that all persons desiring caingin permits be granted them if they can not be persuaded to make homestead applications. The local inhabitants look upon the making of caingins as a natural right.

Hence, it is deemed preferable to attempt to regulate caiñgins than to forbid them entirely. Every effort should be made to encourage the taking of homesteads and the occupying of permanent farms. Inspection should be made during the caiñgin season to locate and punish all persons violating the caiñgin law.

At present it will be impracticable to prevent the annual fires which burn over the grass lands, although forest officers should make every effort to gain the coöperation of the local inhabitants in preventing damage from this source.

REVISION.

As additional information is gained from time to time, the plan of management should be revised whenever such a revision will add to its effectiveness. A careful examination should be made of the tract south of the Baroc River and west of the small Uasig River some time within the next five years.

ADMINISTRATION.

The chief of the forest district in which the tract lies shall have charge of the administration of this working plan. He shall be assisted by such other forest officers who are under his direction as he shall assign to this work.

The district chief, or a subordinate, shall make trips of inspection to the tract whenever it is necessary to mark timber or to perform other duties. In addition to these periodic inspections, a forest ranger shall be placed upon the tract for such time as may be necessary during the caiñgin season to grant caiñgin permits, to prevent illegal caiñgins, and to perform such other duties as may arise regarding the regulation of caiñgins, as well as to report upon any special subject which the district forester may direct.

In cases of violation of the Forest Act or rules and regulations of the Bureau, either by the licensee or by any other person or persons, the forester in charge shall take the matter up with the offending parties in the manner authorized by law for such cases. He shall then report the facts to the Director of Forestry. The forester in charge shall render a special report of work done upon the tract at the end of each fiscal year.

SUMMARY.

(1) Practically all of the commercial forest on the tract examined lies south of the Boñgabon River.

(2) Narra is confined to a belt of forest varying from one-half to two miles in width immediately back of the tidal swamp.

(3) The timber on the foothills at the back part of the tract has been greatly diminished in value and in some places almost entirely destroyed by Mangyan clearings.

(4) The flat land of the tract is, for the most part, suited for agricultural purposes and will no doubt be eventually so used.

(5) The land south of the Boñgabon River, which contains commercial or Guipa types of forest, should be made to produce a second crop. The land north of the Boñgabon River will probably not be reforested, except a part of the Guipa type, but will be used for agricultural purposes.

(6) Caiñgin permits should be granted only upon the Calaanen land, after a personal inspection by a forest officer.

(7) The greatest source of expense in present lumbering operations is transportation. This could be reduced by providing a more permanent tramway, by installing a donkey engine and cable or by using big-wheeled logging carts.

APPENDIX.

LIST OF PLANTS.

The first of the following tables is a list of tree species found on the tract that reach the size of 30 centimeters or over in diameter. The second list comprises all other species mentioned in the text and includes some trees that are below 30 centimeters in diameter when mature. The first list of 88 tree species is fairly complete. In the second list no attempt has been made to enumerate all species under this size found in the forest. Compared with the *Dipterocarp* forest of northern Negros,¹ the floristic composition of this forest is very complex.

The scientific nomenclature used in this paper is based on collections made by the authors and deposited in the herbarium of the Bureau of Science. They wish to thank Elmer D. Merrill for assistance in the determinations.

Tree species 30 centimeters and over in diameter when mature.

Scientific name.	Family.	Local name.	Commercial name.
<i>Actinodaphne philippinensis</i> Merr.	Lauraceæ	Bacan	
<i>Alangium meyeri</i> Merr.	Cornaceæ		
<i>Alstonia macrophylla</i> Wall.	Apocynaceæ		
<i>Artocarpus communis</i> Forst.	Moraceæ	Antipolo	
<i>Avicennia officinalis</i> L.	Verbenaceæ	Apiapi	
<i>Barringtonia luzoniensis</i> Vid.	Lecythidaceæ	Putat	
<i>Barringtonia racemosa</i> Bl.	do	do	
<i>Barringtonia reticulata</i> Miq.	do	do	
<i>Barringtonia speciosa</i> Forst.	do	Botong	
<i>Bischofia trifoliata</i> Hook.	Euphorbiaceæ	Toog	
<i>Buchanania nitida</i> Engl.	Anacardiaceæ		
<i>Canangium odoratum</i> Baill.	Anonaceæ	Alangilang	
<i>Canarium luzonicum</i> A. Gray.	Burseraceæ	Pili	
<i>Canarium perkinsae</i> Merr.	do		
<i>Canarium radikoferi</i> Perk.	do		
<i>Canarium villosum</i> Bl.	do	Palsa hifigín	
<i>Calophyllum inophyllum</i> L.	Guttiferae	Palomaria	
<i>Carallia integerrima</i> DC.	Rhizophoraceæ	Bacauan gubat	
<i>Casuarina equisetifolia</i> Forst.	Casuarinaceæ	Agoho	
<i>Celtis</i> sp.	Ulmaceæ	Malaguibuyo	
<i>Champereia cumingiana</i> Merr.	Ophilaceæ		
<i>Chisochiton tetrapetalus</i> Harms.	Meliaceæ		
<i>Chisocheton</i> sp.	do	Agupanga	

¹ See Everett, H. D., and Whitford, H. N.: A Preliminary Working Plan for the Public Forest Tract of the Insular Lumber Company, Negros Occidental, P. I. *Bur. For. Bull.* No. 5, 1906.

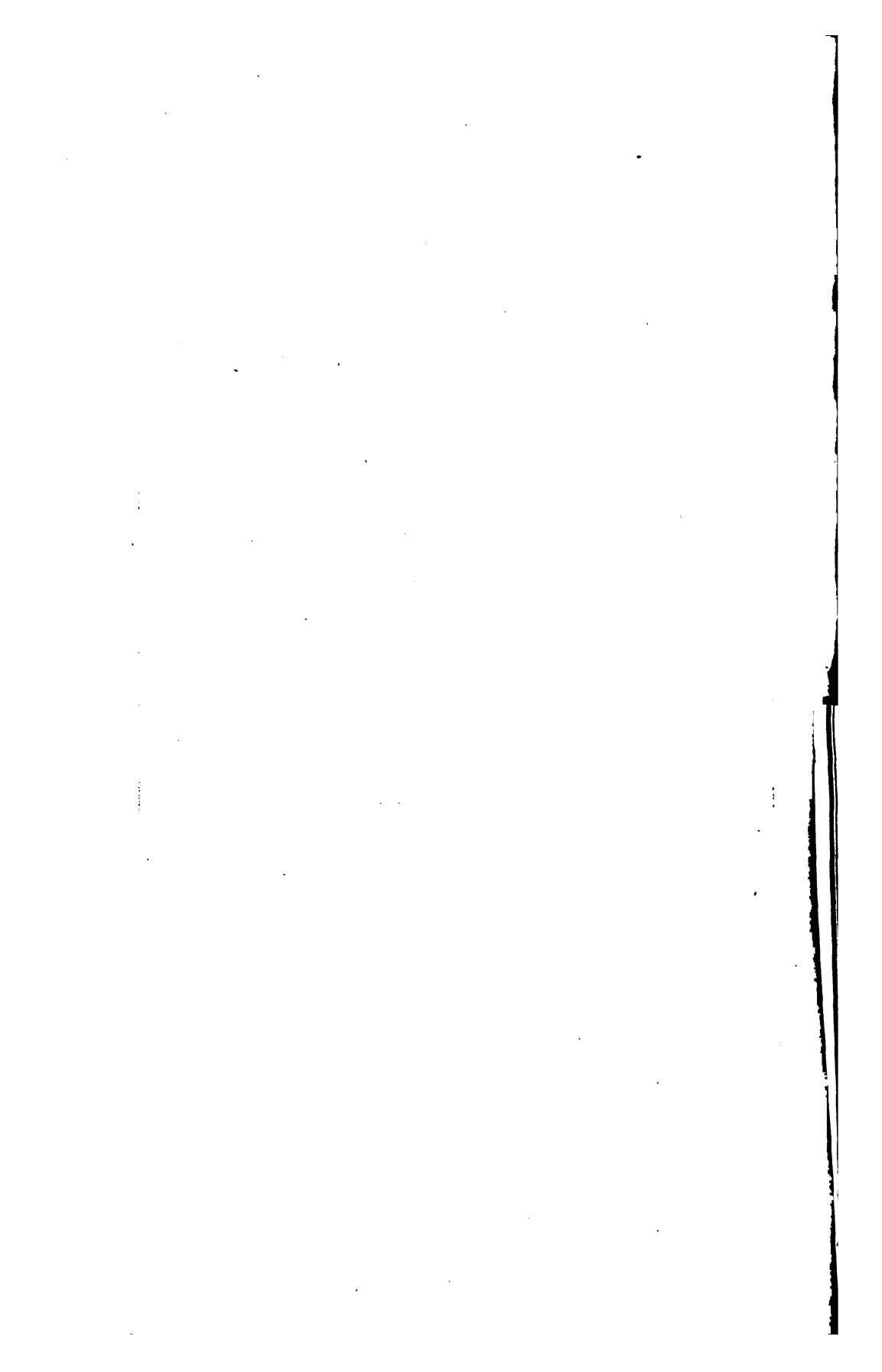
Tree species 30 centimeters and over in diameter when mature—Continued.

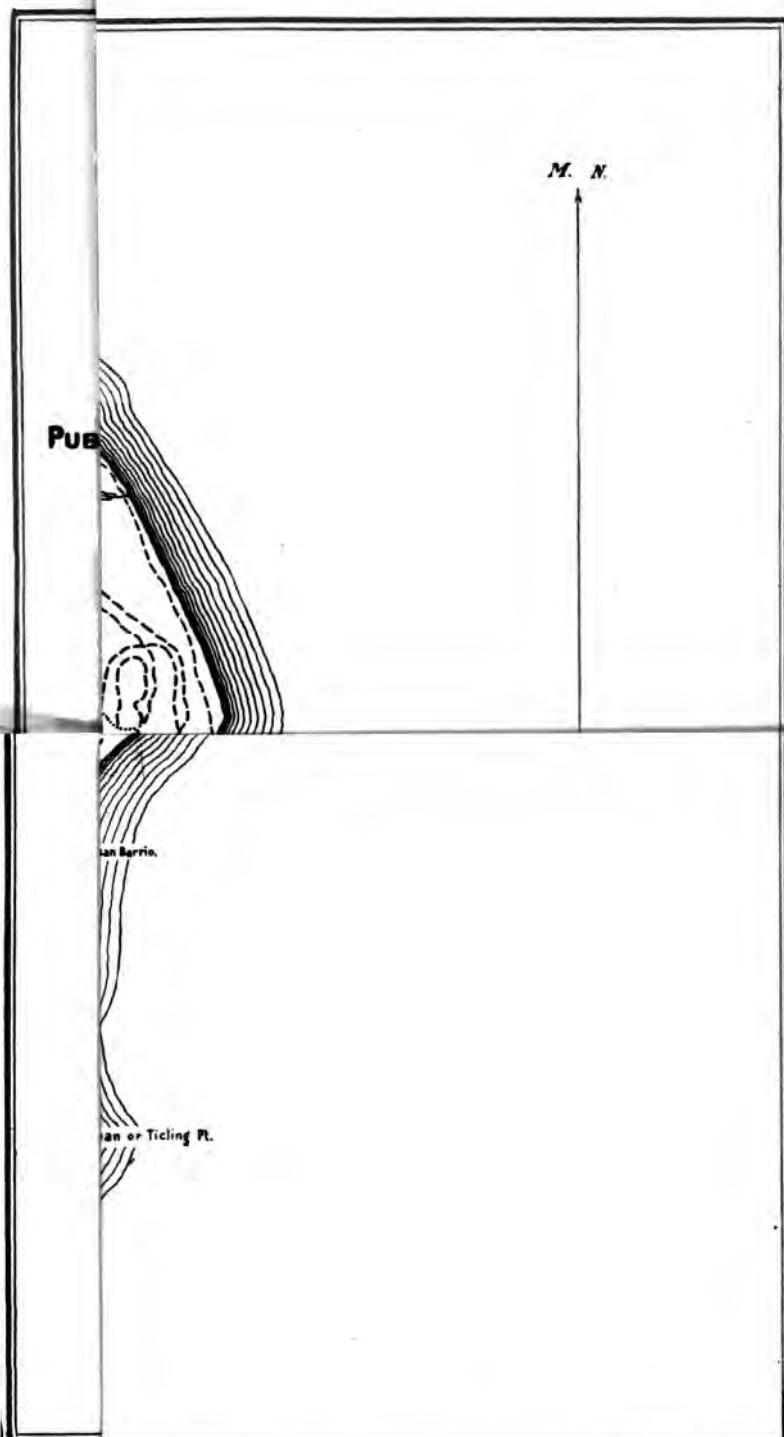
Scientific name.	Family.	Local name.	Commercial name.
<i>Cryptocarya acuminata</i> Merr.	Lauraceæ	Malabacauan	
<i>Dehaasia triandra</i> Merr.	do	Basilayan	
<i>Dillenia philippinensis</i> Rolfe.	Dilleniaceæ	Catmon	Catmon.
<i>Diospyros pilosanthes</i> Bl.	Ebenaceæ	Bolongeta	Bolongeta.
<i>Dipterocarpus lasiopodus</i> Perk.	Dipterocarpaceæ	Hagachac	Apitong.
<i>Dipterocarpus sp.</i>	do	Apitong	Do.
<i>Dracontomelum mangiferum</i> Bl.	Anacardiaceæ	Dao	Dao.
<i>Dracontomelum sp.</i>	do	Malugay	Malugay.
<i>Elaeocarpus oblongus Gaertn.</i>	Elaeocarpaceæ		
<i>Endiandra coriacea</i> Merr.	Lauraceæ	Palusat saling	
<i>Erythrina indica</i> Lam.	Leguminosæ	Dapdap	
<i>Eugenia bordenii</i> Merr.	Myrtaceæ		
<i>Eugenia sp.</i>	do		
<i>Eugenia sp.</i>	do	Alupay	Alupag.
<i>Euphorbia cinerea</i> Radlk.	Sapindaceæ	Salay	
<i>Fagraea integrifolia</i> Merr.	Rutaceæ	Tibig	
<i>Ficus barnesii</i> Merr.	Moraceæ	do	
<i>Ficus nota</i> Merr.	do	Haginit	
<i>Ficus minahassae</i> Miq.	do	Tangisang bayauac	
<i>Ficus variegata</i> Merr.	do	Balete	
<i>Ficus sp.</i>	Moraceæ	Talimadon	
<i>Gonystylus bancanus</i> Gilg.	Gonystylaceæ		
<i>Grewia styloarpa</i> Warb.	Tiliaceæ	Dungon-late	Dungon-late.
<i>Heritiera littoralis</i> Dry.	Sterculiaceæ	Duguan	
<i>Horsfieldia ardisiifolia</i> Warb.	Myristicaceæ	do	
<i>Hornfeldia merrillii</i> Warb.	do	Tindalo	Tindalo.
<i>Intsia acuminata</i> Merr.	Leguminosæ		
<i>Kayea paniculata</i> Merr.	Guttiferae	Amuguis	Amuguis.
<i>Koordersiodendron pinatum</i> Merr.	Anacardaceæ		
<i>Lauraceæ</i> indet.	Lauraceæ	Pungahan	
<i>Litsea perrottetii</i> F. Vill.	do	Bacan	
<i>Litsea sp.</i>	do	Busing cahoy	
<i>Macaranga bicolor</i> Muell.	Euphorbiaceæ	Tabong	
<i>Macaranga tanarius</i> Muell.	do	Binunga	
<i>Mallotus barnedi</i> Merr.	Anacardiaceæ		
<i>Mangifera altissima</i> Blanco.	Myristicaceæ	Pahutan	
<i>Myristica philippinensis</i> Lam.	Lauraceæ	Duguan	
<i>Neolitsea vidalii</i> Merr.	Datiscaceæ	Lenotan puti	
<i>Octomeles sumatrana</i> Miq.	Sapotaceæ	Binuang	
<i>Palauquium luzoniense</i> Vid.	Leguminosæ	Nato	
<i>Parkia roxburghii</i> G. Don.	Nyctaginaceæ	Cupang	Cupang.
<i>Pisonia umbellata</i> Seem.	Leguminosæ	Anuling	
<i>Pithecellobium lobatum</i> Benth.	Leguminosæ	Bansilac	Anagap.
<i>Pterocarpus indicus</i> Willd.	do	Narra	Yellow Narra.
<i>Pterospernum nivale</i> Vid.	Sterculiaceæ	Bayog	
<i>Pterocymbium tinctorium</i> Merr.	do	Taloto	Taloto.
<i>Pygeum latifolium</i> Miq.	Rosaceæ		
<i>Radermachera banaihana</i> Seem.	Bignoniaceæ	Banaihana	
<i>Sarcocephalus cordatus</i> Miq.	Rubiaceæ		
<i>Shorea contorta</i> Vidal	Dipterocarpaceæ	Bancal	Bancal.
<i>Shorea guiso</i> Bl.	do	Leuan	Leuan.
<i>Sonneratia pagatpat</i> Blco.	Sonneratiaceæ	Guijo	Guijo.
<i>Sterculia blancoi</i> Rolfe	Sterculiaceæ	Pagatpat	Pagatpat.
<i>Sterculia foetida</i> L.	do	Candol-candol	Candol-candol.
<i>Sterculia philippinensis</i> Merr.	do	Calumpang	
<i>Stylocyrne macrophylla</i> Bartl.	Rubiaceæ	Baniad	
<i>Terminalia catappa</i> L.	Combretaceæ	Basa	
<i>Terminalia edulis</i> Bl.	do	Talisay	Talisay.
<i>Terminalia nitens</i> Presl.	do	Calumpit	Calumpit.
<i>Terminalia pellucida</i> Presl.	do	Malaruhat	Sacat.
<i>Toona sp.</i>	Meliaceæ	Malagabi	
<i>Trewia ambigua</i> Merr.	Euphorbiaceæ	Calantais	Calantas.
<i>Xylocarpus granatus</i> Koenig.	Meliaceæ	Tabigue	
<i>Xylocarpus obovatus</i> Juss.	do	do	
<i>Xylopia dehiscens</i> Merr.	Anonaceæ		

Other species mentioned in the text.

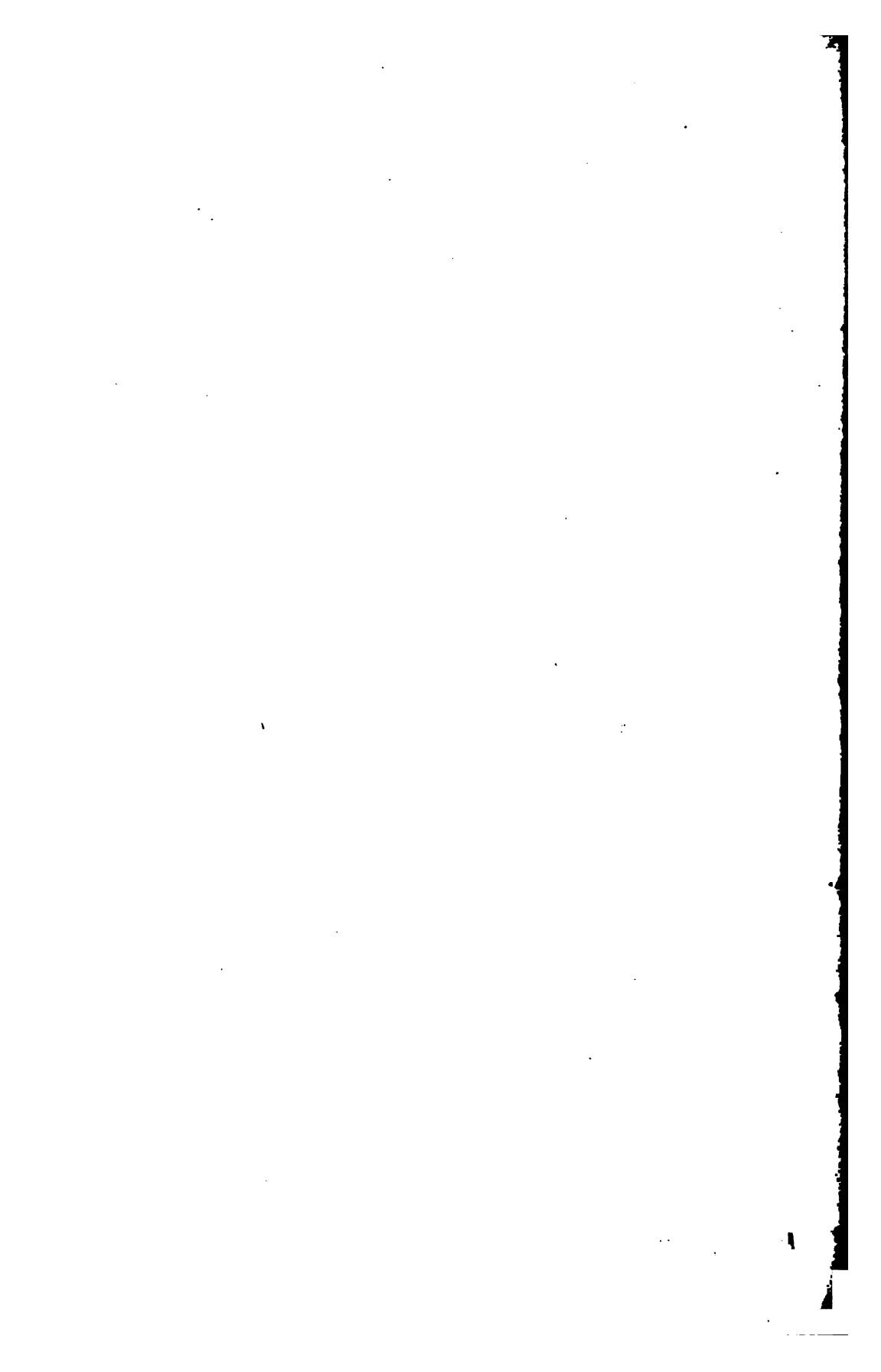
Scientific name.	Family.	Local name.	Commercial name.
<i>Acanthus ilicifolius</i> L.	<i>Acanthaceæ</i>	<i>Doloarin</i>	
<i>Achromichum aureum</i> L.	<i>Polyopodiaceæ</i>	<i>Lagoio</i>	
<i>Areca whitfordii</i> Becc.	<i>Palmae</i>	<i>Bofigan gubat</i>	
<i>Arenga saccharifera</i> Labill.	<i>do</i>	<i>Yroc</i>	
<i>Bruguiera gymnorhiza</i> Lam.	<i>Rhizophoraceæ</i>	<i>Pototan</i>	Bacauan.
<i>B. caryophylloides</i> Bl.	<i>do</i>	<i>Liray</i>	
<i>B. eriopetala</i> W. and A.	<i>do</i>	<i>Pototan Busian</i>	
<i>B. parviflora</i> W. and A.	<i>do</i>	<i>Jangala</i>	Hangaray.
<i>Callicarpa blancoi</i> Rolfe	<i>Verbenaceæ</i>		
<i>Callicarpa erioclona</i> Schauer	<i>do</i>		
<i>Callicarpa formosana</i> Rolfe	<i>Palmae</i>	<i>Pugahan</i>	
<i>Caryota</i> sp.	<i>Rhizophoraceæ</i>	<i>Tangal</i>	Tangal.
<i>Ceriops candolleana</i> Arn.	<i>do</i>	<i>do</i>	
<i>Ceriops roxburghiana</i> Arn.	<i>Verbenaceæ</i>		
<i>Clerodendron macrostegium</i> Sch.	<i>Leguminosæ</i>	<i>Gogo</i>	
<i>Corypha umbraculifera</i> L.	<i>Palmae</i>	<i>Buri</i>	
<i>Cycas circinalis</i> L.	<i>Cycadaceæ</i>	<i>Bitogo</i>	
<i>Cyclostemon microphyllus</i> Merr.	<i>Euphorbiaceæ</i>	<i>Butong manoc</i>	
<i>Entada scandens</i> Benth.			
<i>Ficus haulli</i> Blanco	<i>Moraceæ</i>	<i>Hauilli</i>	Gogo.
<i>Ficus baneasi</i> Merr.	<i>do</i>	<i>Tibig</i>	
<i>Ficus mindorensis</i> Merr.	<i>Palmae</i>	<i>Sagadi</i>	
<i>Heteropathe elata</i> Scheff.	<i>Malvaceæ</i>	<i>Balabago</i>	
<i>Hibiscus tiliaceus</i> L.	<i>Gramineæ</i>	<i>Cogon</i>	
<i>Imperata exaltata</i> Brongn.	<i>Urticaceæ</i>	<i>Lipa</i>	
<i>Laportea meyeniana</i> Ward.	<i>Palmae</i>	<i>Anahao</i>	
<i>Livistona</i> sp.	<i>Euphorbiaceæ</i>	<i>Ham'indan</i>	Palma brava.
<i>Macaranga hispida</i> Muell.	<i>do</i>	<i>Tula-tula</i>	
<i>Mallotus floribundus</i> Muell.	<i>do</i>	<i>Alom</i>	
<i>Mallotus moluccanus</i> Muell.	<i>do</i>		
<i>Mallotus playfairii</i> Hemsl.	<i>do</i>		
<i>Mallotus ricinoides</i> Muell.	<i>Rubiaceæ</i>		
<i>Mussaenda grandiflora</i> Rolfe	<i>Palmae</i>	<i>Nipa</i>	Nipa.
<i>Nipa fruticans</i> Wurm.	<i>Pandanaceæ</i>	<i>Pandan</i>	
<i>Pandanus tectorius</i> Sol.	<i>Axonaceæ</i>	<i>Lenotan</i>	
<i>Phaeanthus cumingii</i> Miq.	<i>Gramineæ</i>	<i>Tagpo</i>	
<i>Phragmites</i> sp.	<i>Palmae</i>	<i>Saraug</i>	
<i>Pinanga insignis</i> Becc.	<i>Rhizophoraceæ</i>	<i>Bacauan</i>	Bacauan.
<i>Rhizophora mucronata</i> Lam.	<i>do</i>	<i>do</i>	Do.
<i>R. conjugata</i> L.	<i>Gramineæ</i>	<i>Talahib</i>	
<i>Saccharum spontaneum</i> L.	<i>Rubiaceæ</i>	<i>Nilad</i>	
<i>Scyphiphora hydrophyllacea</i> Gaertn.			
<i>Trema amboinense</i> Bl.	<i>Ulmaceæ</i>		
<i>Voacanga cumingii</i> Rolfe	<i>Apocynaceæ</i>		

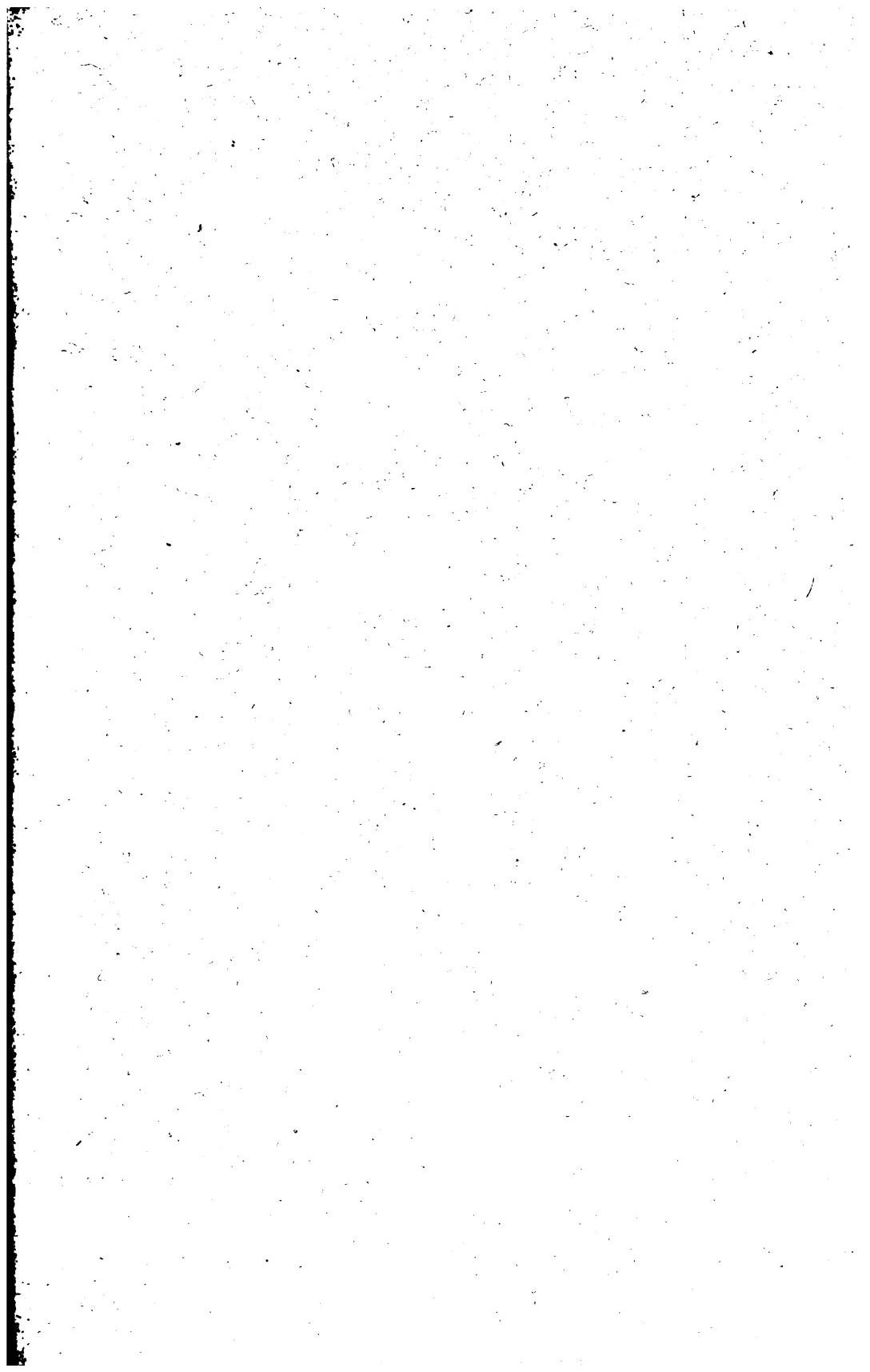


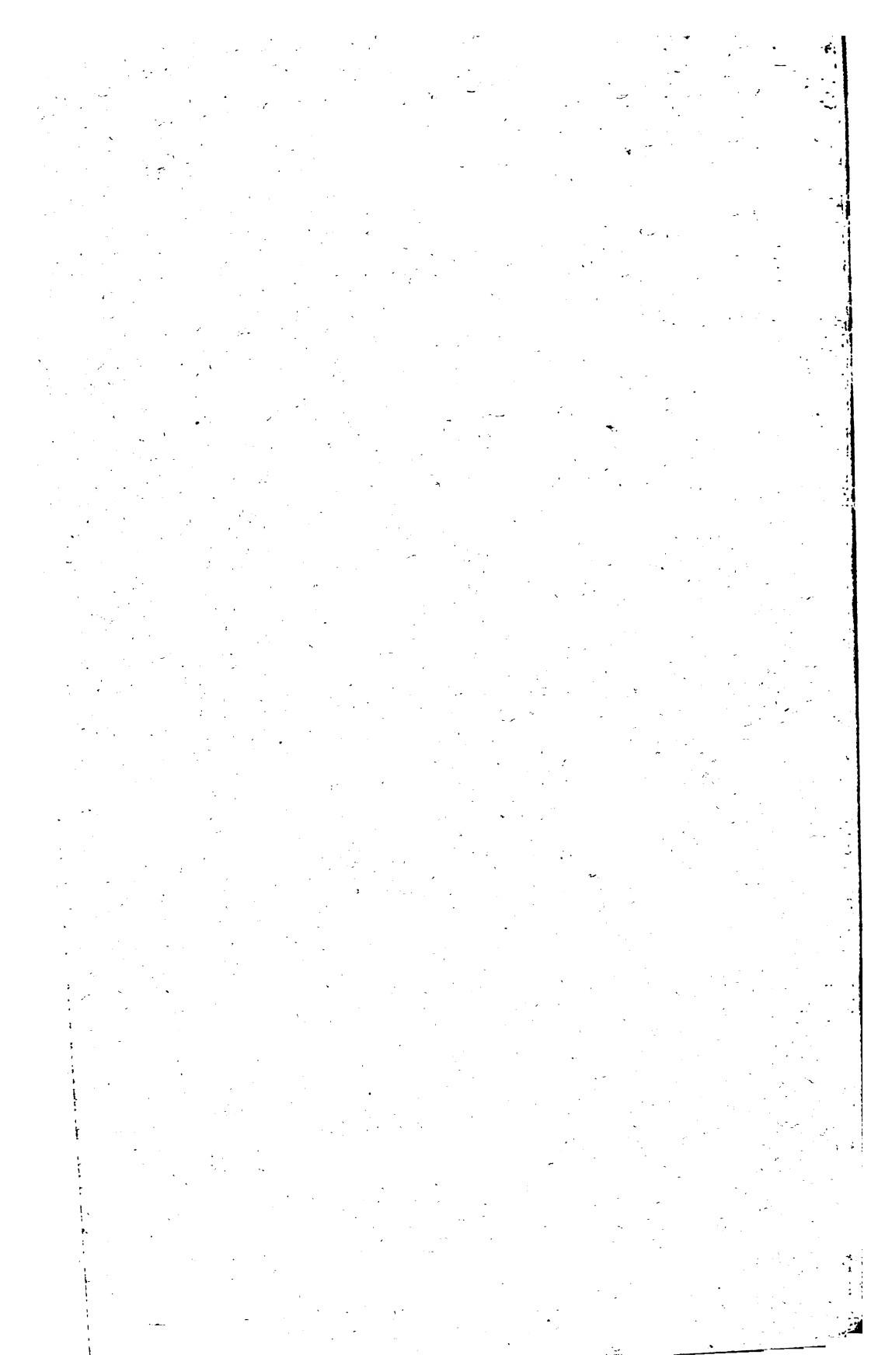




J.CASTRO DEL.













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